Assessment of Haitian Hillside Agriculture Interventions

for USAID/ Haiti

by

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PREFACE

The Haiti Hillside Agriculture Assessment was carried out under SECID's contract for the Productive Land Use Systems (PLUS) project and was conducted between February 1 and March 6, 1999. The Assessment team was initially led by John H. Eriksen, agricultural economist. Dr. Eriksen tragically died while climbing a hillside during the first week of the assignment. After some deliberation, the team and USAID/Haiti decided to continue the work and requested SECID provide another agricultural economist and to send back its assessment coordinator to assist in finalizing the report.

Other members of the assessment team include John T. Russell, agricultural production specialist; Claude St. Pierre, social scientist; Anthony S.R. Juo, NRM specialist; Michael R. Reed, replacement agricultural economist; and, David Dupras, coordinator.

The team would like to thank John Dorman, Marc Eddy Martin and Felipe Manteiga of USAID/Haiti's Economic Growth office for their support and flexibility in assisting us in conducting our assessment. We also want to thank SECID's Chief of Party, Zach Lea, and his capable staff for making the tedious travel and logistics coordination arrangements. In addition, we want to thank the Pan American Development Foundation (PADF) and Cooperative for American Relief Everywhere (CARE) staff for their flexibility, technical support and transportation efforts to assist us conduct our work. Finally, the team benefitted from the reviews of the assessment progress by the USAID Mission Director and her staff.

Given the necessity of gathering information and processing it within a short five week period, with only one team member present the entire time, it was necessary to rely heavily on available secondary data. This constraint was compensated to some extent by the team member's' interviews, but under the circumstances, factual errors and information gaps are possible. To the extent such errors and gaps exist, they are the responsibility of the team members, and, in no way, reflect upon the excellent insights provided to us by respondents.

The team dedicates this assessment in memory of Dr. Eriksen, whose contributions to international development throughout the world were significant and whose presence will be sorely missed by many.

ACRONYMS

ADRA	Adventist Development Relief Agency
AFII	Agroforestry II Project
AOP	Agriculture Outreach Project
ASSET	Agriculturally Sustainable Systems and Environmental Transformations
ATPPF	Assistance Technique pour la Protection des Parcs Nationaux et Forets
BARA	Bureau of Applied Research in Anthropology
BIG	Bio-Intensive Garden
CARE	Cooperative for American Relief Everywhere
CBO	Community Based Organization
CGIAR	Consultative Group for International Agricultural Research
CIAT	Centro international de Agricultura Tropical
CIDA	Canadian International Development Agency
CIP	Centro International de Papa
CRP	Conservation Research Program
CRDA	Centre de Recherche et Development Agricole
CRS	Catholic Relief Service
CRSP	Collaborative Research Support Program
DDA	Directions departementales de l'agriculture
EG	USAID Office of Economic Growth
FLO	Familles libres organisees
GIS	Geographic Information System
GPS	Global Positioning System
GOH	Government of Haiti
HEF	Haiti Environmental Foundation
HPZ	High Priority Zone
IDB	Inter American Development Bank
IICA	Institut Interamericaine de Cooperation pour l'Agriculture
IRR	Internal Rate of Return
MARNDR	Ministry of Agriculture, Natural Resources and Rural Development
MDE	Ministry of the Environment
M&E	Monitoring and Evaluation
MPP	Mouvement Paysan Papaye
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organization
ORE	Organization for the Rehabilitation of the Environment
OPMAGAT	Coffee Cooperative in Les Cayes area
PADF	Pan American Development Foundation
PRA	Participatory Rural Appraisal
PRESTEN	Prese Sove Te Nou
PIDA	Sustainable Intensification of Agriculture Project
PLUS	Productive Land Use Systems Project
PVO	Private Voluntary Organization
SDRT	Service de Defense et de Restauration des terres
SECID	South-East Consortium of International Development
STABV	Secretariat Technique pour l'Amenagement des Bassins Versants
USAID	US Agency for International Development
VLU	Validation and Liaison Unit

EXECUTIVE SUMMARY

Although most of Haiti's mountainous slopes are considered too steep to be arable, hillside residents continue to cultivate them, due primarily to population pressures and lack of alternative forms of employment. Consequently, the steeper slopes continue to erode causing severe environmental degradation; forcing hillside farmers to cultivate even more non-arable land to subsist. Over the past forty years, various Haitian government agencies and donors have sought to address this cycle of rural poverty and environmental degradation through a variety of natural resource management and employment generation projects. Although some progress has been made, the problems of environmental degradation and rural unemployment have intensified, and the vicious cycle continues.

In its efforts to address these problems, USAID has assisted the hillside agriculture sector through various initiatives. These initiatives have evolved over the years from simple agro-forestry and small holder agricultural efforts to the current focus upon community based development and marketing of its natural resources, on a sustainable basis. A number of other donors and international Private Voluntary Organizations have joined USAID in this approach. USAID commissioned SECID to perform an assessment of the hillside agricultural sector. The Assessment, supported by all agencies and donors throughout the country, to sought what effective progress had been made to increase hillside farmer revenues and to preserve the hillside environment.

The purpose of this paper is to offer some preliminary findings, conclusions and recommendations, to assist USAID and its development partners to better assist Haitian hillside farmers break the cycle of their environmental and employment problems and their dependency upon outside assistance.

Principal Findings

- Haitian government resource and infrastructure constraints impede development of the hillside sector. Developmental agencies attempt to fill the resulting void with technical assistance projects.

- Most projects working in the hillside sector promote similar “baskets” of soil conservation and income generation activities. These technologies are effective as they produce the results intended in those areas where they are actively promoted and practiced. Effective initiatives include rockwalls, inter-cropping, agro-forestry, improved marketing techniques, on-farm processing, etc.

- PADF's and CARE's approaches to extension are quite similar, differing more from regions than between the two organizations. Extension methods developed within the PLUS Project are effective at promoting improved income-generating and soil-conserving technologies

within project zones of intervention.

· The spread of improved technologies throughout the Haitian hillsides is slow due to a variety of reasons among which include weak Government of Haiti (GOH) infrastructure, inadequate information exchange, and farmer reluctance to try what they consider to be risky technologies.

Principal Conclusions

· The sustainability of hillside development interventions is questionable without continued donor support, given the weak Government of Haiti infrastructure and lack of a strong private sector presence in rural Haiti.

· The accuracy of estimates of PLUS Project impacts could be improved by moving from farmer-recall data to actual, regular measurement of inputs, outputs, and prices, and by inclusion of social indicators. This change will require training of staff and a considerable increase in resources devoted to M&E.

· An adaptive research component to hillside agriculture projects could increase the cost-effectiveness of extension activities by better identifying the adaptation of technologies and permitting better targeting of extension recommendations. In particular, it would facilitate quicker adoption of introduced germplasm. Research on the tree/crop/livestock interface would increase understanding of constraints to soil conservation technology adoption, and would help identify opportunities to improve soil fertility and reduce soil erosion.

· Some Government of Haiti policies are adversely affecting hillside agricultural development. By supporting ServiCoop and other private-sector groups to increase the net price paid to farmers for export crops, donors can assist the GOH to overcome the policy bias against coffee, cacao, and fruit crops.

· Effective hillside natural resource technologies to improve income and conserve the water and soil exist, but due mainly to poor infrastructure and information exchange, hillside farmers outside of project areas are not adopting these valuable technical packages.

Principal Recommendations

· Recognizing the need to ensure sustainability, donors should coordinate their efforts to improve hillside agriculture by supporting activities to encourage sustainable income enhancement, and transferring land management to communities, involving the GOH and the private sector as much as possible.

· Donors must take a more active role

in promoting NRM and agricultural policies that support sustainable development of Haitian hillsides to overcome current pricing biases. If marketing systems can be improved such that the net price of export crops from hillsides is increased, production of exportable crops will be encouraged.

- Hillside projects should conduct a weaning process to place more input supply activities into a private, for-profit sector and quasi-private sector groups such as producer associations and cooperatives, such as ServiCoop.

- Marketing should be a major component of future hillside development projects, concentrating efforts in three activities: information dissemination, technology and organizational training, and enterprise creation/support services.

- Donors could better address hillside farmer needs by adopting a more multi-disciplinary, holistic, problem-solving, integrated watershed approach. This would better support sustainable revenue generation within the whole hillside farming system, producing benefits for both upstream and downstream farming and non-farming communities.

- A project-based unit responsible for adaptive research and research/extension liaison is needed to improve information exchange and should be established by donors. This unit would have senior staff with expertise in agricultural economics and marketing, social science, soil and water conservation, and adaptive (i.e., on-farm) research. The unit could also be charged with M&E, and with training of GOH staff in farming systems research/extension methods and marketing.

- To be cost-effective and sustainable, agricultural extension activities should focus on technical support services to core farmer groups; information and training for larger, more varied audiences; input supply (in the short term) to a large number of clients; and implementation of soil conservation works.

- An information exchange program is critically needed. USAID should take the lead to improve the flow of information related to hillside agriculture at the national and international levels. This should be an objective of USAID's upcoming conference.

- Donors and Non-Governmental Organizations (NGOs) should only support those soil conservation projects where intended beneficiaries are the most likely to be committed to adopt proposed technologies, based on “triage” criteria. These criteria will vary regionally and should be an important part of the selection decision.

- Future hillside agriculture project designs should be based on cost-recovery as a means to reduce subsidization and promote sustainability by encouraging private sector agricultural marketing activities. Given the

disparity of the hillside resources, projects should work with those groups that have the necessary human and natural resources and infrastructure to succeed.

I. INTRODUCTION

A. Objective

The objective of this assessment is to review interventions in the Haitian hillside agriculture sector, as practiced by small farmers and supported by all development organizations, including the Government of Haiti (GOH), Private Voluntary Organization (PVOs), NGOs and donors. The assessment team is responsible for identifying strengths and weaknesses, lessons learned, and new marketing opportunities to improve small farmers' incomes and to protect against environmental degradation.

B. Team Composition

Funded by USAID/Haiti under SECID's contract for the Productive Land Use Systems (PLUS) contract, the assessment team was composed of five technicians. At the request of USAID/Haiti, none of the candidates for the team had extensive experience in Haiti. The team included:
An Agricultural Economist, an Agricultural Production Specialist, a Natural Resources Management Specialist/Agro-Forester, a Social Scientist and a Coordinator. All team members were experienced professionals with appropriate international and technical expertise in small-holder hillside farming systems agriculture and program assessment.

C. Methodology

The terms of reference instruct the assessment team to "examine all hillside agricultural activities… in close collaboration with the institutions involved in the implementation of the PLUS project: PADF, CARE and SECID." In gathering the necessary information for this report, the team reviewed available documents pertaining to hillside agriculture in Haiti, regardless of donor or NGO support, in order to assess successful and unsuccessful hillside interventions. Team members interviewed expatriate and Haitian technical advisors and personnel from donors, PVOs, NGOs and the Government of Haiti, as well as hillside farmers and private sector entrepreneurs providing inputs and marketing services to these farmers.

During the five week period from February 1 through March 6, 1999, team members traveled to the North, Northwest, West, Grand'Anse, Center, and South West departments of the country inspecting various hillside sites including Cape Haitian, Hinche, Jeremie, Port-de-Paix, Kenscoff, Les Cayes, Camp-Perrin, Mirebalais and Lascahobas.

Suggestions of site selections and people and organizations to interview were provided by USAID/Haiti and by SECID/PLUS, which employed a local agricultural specialist familiar with

hillside agriculture throughout Haiti. The staff of the SECID/PLUS office ably provided local logistical and transportation arrangements, in close coordination with the staffs of PADF and CARE.

D. Background

Haiti is a mountainous country with almost two-thirds of its land on a slope of more than 20%, making its soil susceptible to wind and water erosion. Generally, land with a slope of more than 20% is considered "non-arable". However, since the majority of Haitians derive their livelihoods from agriculture, increasing population pressure is causing more of the steeply sloped hillsides to be put into production. It is estimated that only 1/3 of the land is arable by conventional standards though over half of it is now put into agricultural production. As a result, hillside land is being degraded by erosion, which reduces farmers' incomes and their standards of living.

1. Experiences with Hillside Agriculture in Haiti

a. History of Involvement in Hillside Agriculture

Various organizations have been working to improve hillside farmer production and conserve hillside soils in Haiti over the past fifty years. Some of these organizations developed projects which dealt with entire watersheds while others deal only with areas along the hillside slopes. The assistance offered to hillside farmers has been primarily the provision of technical agriculture advice and the distribution of agricultural inputs, although some have taken an integrated approach and have introduced credit, health and rural development measures such as water catchments, road improvements, etc.

Over the years, numerous projects, supported by the GOH, a variety of donors, research and training institutions and NGOs, have developed diverse bundles of technical agricultural services and extended these packages to hillside farmers. Some projects assist farmers to market their produce and encourage on-farm and village-level processing to add value to hillside products before sale. Most of the services and inputs supplied by development agencies are given away at little or no cost to the farmers.

Many hillside projects have supported the construction of soil and water conservation devices; some have provided "tool banks" to allow farmers to borrow the necessary hand tools for the work. Some projects have conducted agricultural research to support the development of the technical packages. Such research has been aimed at testing the appropriateness and efficiency of project-promoted plant germplasm, cultural practices, soil conservation techniques and structures. Other projects have developed their packages based on "off-the-shelf" germplasm material and extension of soil conservation measures which have been observed to be effective, without scientific verification. A

number of hillside intervention efforts have dealt exclusively with commercial crops such as cocoa and coffee.

Some efforts have addressed the integrated farming system and have addressed constraints to wood and food crop production, including livestock. Other projects have concentrated their efforts on soil and water conservation measures to decrease degradation of the hillsides and have promoted wood and fruit tree plantings and forages to mitigate erosion.

b. Interventions and Technological Introductions

Table 1, found at the end of this section, presents the historical phases of project approaches to hillside interventions in Haiti as provided by various development institutions.

Religious organizations have been among the most consistent among the major players in introducing hillside agricultural improvements to germplasm and promoting more efficient and effective farming techniques, including soil and water conservation measures. Over the years these interventions and technological introductions have been informally shared among the various organizations so that many of the interventions are identical. However, much of the research which has been conducted appears to have been lost and there does not appear to be any formal information storage facility or information sharing network.

2. USAID Experience with Hillside Agriculture in Haiti

As the purpose of this assessment is to focus upon hillside interventions with a view to making recommendations for more effective and efficient future development activities, this report will focus upon the team's finding and recommendations and will only provide a cursory overview of the extensive history of the various institutions involved in Haitian hillside agriculture.

a. History of Involvement in Hillside Agriculture

USAID concentrated its assistance to hillside agriculture primarily through integrated development projects and soil conservation, agro-forestry-forestry projects, among which include:

b. Interventions and Technological Introductions

Throughout the last twenty years of project interventions in Haiti, USAID-financed developmental efforts have conducted various activities, including applied and adaptive research, integrated rural development of watersheds, agricultural marketing support, and various forestry and agro-forestry projects, as well as centrally funded activities to support livestock and soil and water conservation. The majority of these interventions focused on improving or preserving the fragile hillside agro-ecosystem while increasing farmer revenues. During this time a number of technologies have been introduced through the various projects working with GOH agencies,

Watershed Management Project of Maissade (1986-1992) was implemented by Save the Children Foundation to work in small, degraded watersheds in the Maissade area.

Targeted Watershed Management Project (1986-1991): Implemented by Associates in Rural Development . This project concentrated on integrated rural development hillside activities working with the local NGOs and created the *Secretariat Technique pour l'Amenagement des Bassins Versants* in the Ministry of Agriculture to coordinate NGO watershed activities and information exchange.

Agro-forestry Outreach Project (1981-89) was implemented by CARE and PADF in conjunction with technical assistance from Operation Double Harvest and the University of Maine and SECID/Auburn University.

Agro-forestry II Project (1989-91), was implemented by PADF and CARE with assistance from SECID/Auburn University. This project promoted tree planting, supported agricultural outreach activities, conducted adaptive research and introduced soil and water conservation measures.

Productive Land Use Systems (1992-present) evolved from AFII, after the 1991 *coup d'état*, and is implemented by PADF and CARE with technical assistance from SECID/Auburn University. This project shifted emphasis from tree extension to sustainable agricultural production through a continuation of outreach programs by PADF and CARE, and a concentration on marketing of hillside agricultural produce by SECID.

Agriculturally Sustainable Systems and Environmental Transformation (1997-present), implemented by Winrock International, International Resources Group and Datex, is focusing its integrated rural development activities upon the *Riviere*

local and international NGOs and small farmer groups. These can be broken down broadly into two main categories:

c. Soil and Water Conservation

The interventions introduced include checkdams or gully plugs in ravines, rockwalls, contour channels, hedgerows, stubble and crop contour bands and general tree planting as a series of means to protect the soil from further erosion. Additionally, USAID has supported applied and adaptive research through various projects to better protect and increase soil fertility, and thereby productivity, of the fragile hillsides.

d. Income Generation

Various projects supported by USAID, as well as other donors, have promoted the planting of different types of wood and fruit trees as income generating actions to complement agricultural food production. Intensive vegetable gardens, using organic amendments, both conserve the soil and water and dramatically increase rural incomes. Additionally, USAID projects have also promoted adding value to hillside agricultural produce by promoting more on-farm and village-level processing of commercially viable crops, as well as introducing "off-the shelf" improved germplasm and techniques to increase crop production and farmer revenues.

e. Sustainability

For the most part, sustainability and cost recovery of interventions have not been critical design concerns of the sponsors of hillside development projects. Therefore, the continuation of these activities is sustainable with continued donor technical and financial assistance, with an emphasis upon better promotion of the private sector, more involvement of GOH agencies, whenever possible, and a devolution of land management to local communities.

TABLE 1 [see next page]

Table 1. Historical phases of project approaches and their institutional environment.

	Project approaches to		USAID funded projects	PADF activities	CARE activities	Other donors	Government of Haiti		Natural resource management training	Resource base indicators	Major resource base events	Political changes	Community based organizations
	Natural resource management	Agricultural intensification					Natural resource management	Agricultural intensification					
1940													
1950			HACHO				Watershed engineering (Equipement du territoire)						Coffee & cocoa cooperatives
1960				Creation	Operates in NW Haiti	AAA in NW Haiti						Duvalier father	
1970	Soil cons technology transfer			Haitian dvt foundation			Some large scale reforestation					Duvalier son	
1980	Voluntary tree plantation fruit trees agroforestry 116 projects 252 projects	Integrated agriculture development Some FSR/E projects	AOP SECID research STABV PST	AOP	AOP & others Stops labor payment		STABV project coordination		FAO Limbé training center		Eradication of creole pig		Creation of numerous local groups
1990	More fruit tree projects		AFII PLUS PLUS extended ASSET PLUS extended	AFII PLUS Marketing	AFII & others PLUS Operates in NW and GA Marketing Forest Parks	EU resumes Canada AF WB FPPTAP WB PIDA	MARNDR policy reform EAP preparation MARNDR decentralization		FAMV has NRM engineer degree Damien AF school reopens		Charcoal production boom	Aristide Cedras Embargo GOH stabilization & reform program	
2000 /													

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II. FINDINGS

A. Institutions Involved in Hillside Agriculture

Haiti's hillside agriculture sector includes all elements of the country's unique balance of stakeholders. Some positive aspects of the Haitian situation are the long-term commitment and involvement of NGOs in the rural sector in general, and in hillside agriculture in particular. In addition, the Community Based Organization (CBO) sector is growing rapidly, as more enlightened populations realize they can better manage their own resources. Some negative aspects—in addition to the near complete absence of government services in rural areas—are a very constrained flow of information, a weak transportation infrastructure and the limited presence of the formal private sector. The forum ("*plateforme*") of institutions working in hillside agriculture, identified in 1998 by the Ministry of Agriculture (MARNDR), is an effort to address these constraints. This forum includes three other central government institutions, 13 international NGOs, 23 Haitian NGOs (four religious organizations, two foundations, and 17 other NGOs) and USAID. A list of these organizations is contained in Annex H.

1. NGOs and Hillside Agriculture

The projects working in hillside agriculture do so without a viable Government of Haiti (GOH) extension service. Because there are usually no functional GOH offices, NGO hillside projects typically constitute full-sized agricultural extension institutions in themselves. Each has its own diversified set of activities and its own specific approach to logistics, human resource management, funding mechanisms, and institutional culture. Some projects pay farmers to adopt technologies, such as for constructing rockwalls. Many projects effectively involve CBOs and producer groups that provide members to serve as extension agents to maximize spread of information and technologies in a cost-effective manner. Projects employ technical people to help with the interventions, but the field people (extension agent from the communities) will know more about the local farming system and how interventions can be adapted to each system. Such a de-centralized structure makes it more likely that farmers will directly benefit from the project.

Hillside agriculture projects in Haiti have a 50-year long history and the USAID-funded AOP/AFII/PLUS projects started almost 20 years ago (***Table 1***). Many Haitian and expatriate NGO staff members have been working 10 to 20 years on these projects. Institutions and individuals stress that important changes have taken place in project approaches. Changes include moving from traditional, pure soil conservation to inclusion of agro-forestry and more varied interventions. There have also been changes from a top-down approach to a higher degree of farmer participation.

The strong linkages with the NGOs and farmer groups, coupled with a strong training component, makes it more likely that benefits will extend beyond the project life. The village\ extension

agents who have worked on hillside projects for many years will stay in rural areas and form the backbone

of an informal extension service. Their experience and training will be vital ingredients for improving hillside agriculture for many years.

Technology improvement projects currently deliver a bundle of services. These include not only extension, but also on-site supervision of farm improvements (particularly tree planting, grafting and soil conservation), support with inputs, and assistance in agricultural product marketing. Some projects also carry out credit, small water supply works and more substantial input supply (animals, tools, cement, input stores). Only a few existing projects such as Agriculturally Sustainable Systems and Environmental Transformations (ASSET), and one former USAID-funded project (Save the Children in Maissade), involved community facilitation of watershed management as a specific activity, whereas this is a routine activity in improved land use projects elsewhere in the world.

Logistics tend to absorb a large proportion of resources and time. CARE targets poorer localities with agricultural potential. In the Grand'Anse, 33 out of 46 project localities have no road access The project maintains mules to access these localities and aims to contact 40-60% of the working population in each locality. One religious NGO project visited works in sites eight hours by foot from the road. In Cap Haitien, PADF locations are generally within one hour's walk from the road, to allow full supervision and to help those farmers with better access to markets.

However, the sustainability of these activities is an issue as a number of NGO and donor funded development projects subsidize the cost of these technical services. This problem is further complicated by the anecdotal evidence that some farmers will not implement technologies if they are not paid for their labor or given all inputs.

2. Cost Recovery

Designs of hillside projects rarely take cost recovery into account. This is an emerging issue in health projects in Haiti. There are clear indications that subsidy rates can gradually decline in such projects. Under PLUS and several other projects, farmers receive inputs and technical services without cash contribution. In-kind revolving funds are being set up in some cases (for example in PLUS seed supply activities). In the past, provision of food aid and wage labor opportunities was common in soil conservation and tree planting projects. Such provision has been phased out progressively (except during the post-1993 employment generation projects). In Northwest Haiti, a focal region for food aid, CARE stopped paying farmers for their participation in tree planting in 1994, and Agro Action Allemande—also working in the Northwest—stopped all farmer cash and in-kind labor payments in 1996. Conversely, some small-scale projects in the South still pay farmers for their labor, and make direct donation of larger-scale equipment. The PFI artificial lake project near Hinche, for example, has just

received 2 bulldozers from the central government. In the absence of a project, however, most farmers buy corn and bean seed on the local market, and cash crops producers purchase modern agricultural inputs at full cost and directly from the private sector

3. Information Systems

Hillside agriculture projects face four types of problems relating to information flows. First, the top-down structure of NGOs has been necessary to implement project activities in difficult logistical environments. This structure, while efficient, has cut normal, unconstrained information flow within and among different organizations.

Second, project staff and farmer interactions, other than daily interaction by field agents, seem to be limited. They often take the form of group meetings in which the quality of exchange is typically low. Feed back from participants for many projects, including CARE, rely mostly on surveys using closed-answer questionnaires, whereas CARE in Asia uses mainly Participatory Rural Appraisal (PRA) techniques. Haitian staff has nevertheless received generally adequate education in participatory fieldwork methods in FAMV. According to some project managers, differences in social status between farmers and senior Haitian staff also contribute to a communications barrier.

Third, political obstacles and social insecurity are reportedly significant obstacles. The few in-depth rural studies that have been done could only be undertaken in small localities (Maissade commune in the central plateau, or Salagnac in the South). These limitations serve to obscure the high degree of diversity among neighboring agricultural regions.

Fourth, international exchanges are limited in scope and variety. For example, the Mountain Forum (http://www.mtnforum.org), an international electronic forum dealing with mountain agricultural issues around the world, has only one of its 971 members based in Haiti. Report bibliographies indicate how little communication there is between English- and French-speaking aid communities. All these problems may be reinforced by the absence of effective information clearing venues. Many publications about Haiti are not easily available in Haiti.

On the positive side, some progress is being made. To facilitate interchange among faith-based development programs, ECHO organized an agricultural conference which was met with such enthusiasm that Haitian leadership has turned it into an annual event, inviting secular organizations as well.

4. Group Formation in the Hillside

Almost all projects work with some type of farmer group. CARE does not work with existing CBOs, but its community development approach leads to the creation or enforcement of

traditional work exchange groups. There is a self-selection process of peers in traditional work exchange groups (in Haiti as elsewhere), symbolized by the social obligation to take turns to offer a decent meal to co-
workers. Larger groups and cooperatives appear to have stronger processes of peer selection. In one cooperative in Cap Haitien, according to its board, farmers willing to join a PADF extension workgroup should live in the locality, own coffee land, be able to read and write, and buy 125

gourdes of cooperative shares and 20 gourdes of extension workgroup shares. Larger farmer groups also include local leaders and contribute to securing relationships within the community between these leaders and their audience.

Political affiliation plays an important role in some groups and none at all in others. Many of the organizations involved in hillside projects are dominated by the local elite, so activities can inadvertently serve to increase the political power associated with these pre-existing groups. Some of these organizations were established in the past for political purposes and they are naturally exclusive. For example, MPP (*Mouvement Paysan Papaye*, a large-scale CBO near Hinche, with strong involvement both in hillside agriculture and in national politics) requires participants to form 'agro-forestry corps' (*brigade agrosylvicole*) of 6-8 persons before letting them join the project. One result was that, prior to 1994, soil conservation technology adopters in the region were immediately identified as MPP members.

OPMAGAT, a marketing cooperative in the Cayes region collaborating with PLUS, represents the diversified opportunities which larger organizations provide to their members. It has essentially the same membership as the local coffee cooperative, which was created in 1962. OPMAGAT provides monthly stipends to 5 board members and allocates wage labor opportunities to its own members at the rather high rate of 45 gourdes/day. OPMAGAT has also operated a large root-trainer tree nursery for PADF since 1992. It has successfully applied for grants to receive a truck and cassava milling equipment and has processed and marketed cassava flour through PLUS.

Wiens (1998) argues that widespread private sector development is the best way to break down the political and social structures that have hampered hillside agricultural development. Firms with a profit motive have a vested interest in overcoming these barriers because they are interested in selling products to everyone. The private sector has been a missing ingredient in the mix of entities involved in hillside agriculture. Metzel (1999) observed that private fertilizer distribution is hampered because the GOH receives donated fertilizer and distributes over 50% of it directly or through NGOs. Together the private sector, CBOs, NGOs, and others will find a way to structure highly effective programs in the hillsides.

5. Government of Haiti

All the projects and non-governmental organizations met by the assessment team claim to have—or have tried to foster—linkages with the Ministry of Agriculture (MARNDR) extension and researchers Center for Agriculture Research (CRDA) and with Ministry of Environment (MDE) staff. Linkages are constrained by the GOH's limited resources, including staff shortages, which are particularly acute in the MDE. Mid- and upper-level MARNDR staff are overextended in their attempts to collaborate with various projects. They are also severely constrained by the lack of financial and material resources available to them. The difficulties of collaboration, due mainly to

differences in resources available to project-supported personnel on one hand and GOH staff on the other, has resulted in a high level of frustration on the part of both sides.

There exists widespread recognition that projects and NGOs need to work with GOH staff to the greatest extent possible in order to enhance their sustainability to provide technical support to the hillside farmers and to diffuse and encourage information exchange. Improved incentives to attract more trained Haitian researchers and extension personnel to government work, and to motivate those currently there, are needed if linkages are to be developed further.

Two aspects of changing government roles are of direct interest to hillside agriculture programs: MDE is in the process of finalizing its National Environmental Action Plan (NEAP). This plan calls for selection of strategic watersheds as focal areas for hillside agriculture interventions. Improved watershed management is one of the four strategy components of MARNDR. The ministry's office-in-charge has retained its name, SDRT (*service de défense et de restauration des terre*s), but has recently endorsed a shift to a participatory, farmer-based approach, with the objective of starting to design land use plans at commune section level or below.

The MARNDR and MDE have offices in the departments, but they do not have enough resources to be effective in the rural areas. However, they can be helpful in assisting NGO- and donor-supported projects. The PADF has cooperation agreements with the local Agricultural Departments
offices (DDA and CBA) in their areas, which include MARNDR technicians collaborating with the PADF project personnel.

B. Target Groups

Many hillside agricultural projects have general definitions of target populations with whom they will work. Some are defined by the watershed in which they live while others are defined by the crops they produce. Most other NGO-supported projects, state that they broadly target poor hillside farmers. Rural sector interventions with loose definition of target groups tend to create *de facto* client groups. This is the case for agricultural extension programs in many other

countries, whether under an aid project or not, and for aid projects in Haiti, whether they are doing agricultural extension or not.

The NGOs working under PLUS have different criteria of populations with whom they work. CARE, in the Grand'Anse, has a pro-active targeting strategy, i.e., a strategy other than simply targeting those farmers who express an interest in participating. CARE actively seeks to include poor farmers whose hillside plots are away from roads; and the PADF tends to select its farmer groups working near roads in order to best market their produce; and the ASSET project targets farmers working in the two watersheds providing water to Port-au-Prince.

Although the outcome of the PLUS impact survey was not available at the time of this assessment, participant incomes are reportedly above those of non-participants. Few projects in the Haitian hillside sector appear to be working with farmers at the top of the watershed. It should be noted that the resources available to some projects—as well as the political, geographical and logistical aspects of some areas—may make it extremely difficult to work very far from roads. Two recently begun projects, Assistance Technique pour la Protection des Parcs Nationaux et Forêts (ATPPF) and ASSET, do aim to work in upper watersheds.

C. Technical Support to Projects

1. Technical Personnel

There are a number of well-qualified, experienced Haitian agronomists (*agronomes)* working in the country. These *agronomes* have at least the equivalent of a BS degree in general agriculture. The majority of them are working with international organizations, multi- or bilaterally funded projects or NGOs. GOH staff also appear to be well trained. However, GOH employees have little resources at their disposal to provide much extension or research support to projects.

In addition, a number of hillside projects employ and train local farmers to become community-based extension agents. Often these agents are paid by the communities, with project support. These farmer agents serve to provide technical support to their neighbors and as spokesmen to project technicians.

2. Information Systems

There appears to be little information or data sharing among donors and NGOs on hillside agriculture. Farmers and projects are affected by this particularly weak information sharing. Illiteracy remains prevalent but many households now have at least one younger member who can read. Farmers in Dondon (Cap Haitien) have indicated that the factor most limiting to the dissemination of written information is not illiteracy, but rather the unavailability of written technical materials.

Few projects were observed to have many *fiche techniques* or technical information bulletins for diffusion of technologies to their farmers. In addition, few projects had newsletters or information exchange mechanisms to communicate with other projects addressing hillside constraints. There also did not appear to be any formal market information dissemination system within or among projects, and little information concerning markets and prices conveyed to farmers. Jolly (1993) found that most of the farmers receive information through visits to the village market and through discussions with other farmers. There is, however, a monthly bulletin published by CARE in the Northwest that provides good information on local rainfall, prices, and production which is reportedly distributed to NGOs and donors in Port-au-Prince.

Team members met a private entrepreneur who presents various agricultural topics on a radio program every Sunday on Radio KINI (FM92.9) and periodically during the week on a variety of stations. The program covers cropping practices, plant diseases, soil conservation measures, markets, climate and other topics of interest to farmers. The same person also does agricultural programs on a fee-for-service basis. Another radio program, produced by a private agricultural supplier, Agroservice, broadcasts agricultural information three times each week, under its advertising budget.

Lastly, there does not appear to be a central location for the collection and sharing of technical information available in Haiti. The team learned that years of valuable research data conducted by scientists in Salagnac are being stored in boxes and are unavailable to the public. Additionally, there appears to be a *platforme* of concerned NGOs and donors organized to address hillside farmer constraints but it meets irregularly and is not widely known by many project personnel. We understand that the Inter American Development Bank (IDB) has recently signed a loan with the GOH to improve market information in the agricultural sector.

3. Training

Interviews with various project technical personnel indicate that most desire additional training in their own technical discipline so as to have the latest, most up-to-date information. Interviews with village extension agents indicate that they desire technical training in soil conservation, crop protection, and general agricultural techniques. They would also like to have training in how to train fellow farmers.

D. Social Issues in Hillside Agriculture

Most hillside projects have typically taken a watershed-wide, farmer-led approach to activities. This approach has had many benefits because the interventions and technologies can be integrated more directly into the farming system, especially when the extension agents are local farmers too. However, many projects have not always considered the importance of social impacts in their design and few have social scientists on their implementation teams.

1. Land Tenure and Access to Fertile Land

Recently, projects have focused on working with groups of farmers because it has been determined that social interactions help ensure adaptability, such as group labor to construct checkdams and other soil conservation structures.

In Cap Haitien, PADF works through 20 coffee/cocoa cooperatives and nine women groups. A rapid rural appraisal exercise in the Dondon Commune (Devienne, 1997) has identified eight types of households. The two better-off types farm more than four *carreaux* (a *carreau* is 1.29 hectares) in the valley and probably market their coffee without going through a cooperative. The three poorer categories (households with a home garden only, or with up to two *carreaux* but no flatland) produce no coffee or too little to justify cooperative or association membership. The three categories in between (from 0.5 to 4 *carreaux*) farm both slopes and flatland. Gully plots are owned by the better-off farmers among the three middle categories. PADF client groups, who own coffee and gully plots, are likely to be from one of these categories.

The situations change, depending upon the locality. In Les Cayes, for example, the *leucaena hedgerows* are well adapted to those farmers owning partially denuded slopes, which are often used as cow pastures, even in areas remote from the roads. PADF estimates that more than half of project participants in Les Cayes do not own flatland, and a similar proportion do not have tin roofs on their houses. Land tenure insecurity in general, and shareholding in particular, are cited as major constraints in the adoption of improved practices in this area.

In Dondon, PADF has found that 40% of plots are owned, 30% are undivided inherited land, and only 8% are sharecropped. In this sort of situation, land tenure is not a major limitation to tree planting and soil conservation. Conversely, many communes have a large portion of land under sharecropping, and in some regions land tenure is considered more insecure.

According to the Maissade report (White, 1992), farmers belonging to "*groupement*" and who participate in labor exchanges in general are more progressive and tend to adopt new technologies at a higher rate. These farmers are more likely to adopt new technologies than non-members: 79% versus 29%. Additionally, it was found that farmers on upper and middle slopes influenced participation, refuting the hypothesis that holders of side slope and downstream farms had the greatest incentives to participate. Upper and mid-stream slopes are more likely to benefit from checkdams, providing economic incentives.

Overall, land tenure is an important issue for improved watershed management as a whole, but generally not for farmer-based projects working on selected, smaller portions of a watershed.

White concluded that the lack of legal land tenure or the wealth of the farmer does not appear to be a major factor in technology adoption. Similar findings were reported in other hillside

sections of the country and are manifested in Camp-Perrin where sharecroppers make improvements to their landlords' property as a condition of their rental payments. It appears that strong social ties with farmer participants and their extended families had more effect than land tenure constraints.

In Camp-Perrin, PADF is playing a facilitating role to ensure stable shareholding contracts on plots for landless farmers to work on and make improvements to their landlords property, under PLUS technical supervision.

2. Gender Issues

Despite a growing awareness of gender issues in Haiti, the absence of gender-related analysis in agricultural projects and research programs is striking when compared to other countries. Only five gender-related sources were identified by a 1998 study of gender and poverty in Haiti. Of these, two dated back to the early 1980s, one related to a commune-level micro-project, and two were the CARE livelihood security baseline studies (World Bank, 1998a).

NGO and government programs typically establish gender targets to ensure that men and women participate. PLUS is successfully using a gender-sensitive approach where participants are individual persons, not households. This project has also incorporated more female field staff since 1994. Only Canadian-funded projects appear to benefit from technical assistance with specialized gender expertise. While social and cultural factors will continue to create barriers for women, an improved gender approach can help hillside agriculture projects avoid negative impacts on women, particularly when these impacts have repercussions on income and environmental degradation. For example, men are expected to retain a disproportionate part of income derived from coffee or cocoa sales, so that project interventions are best not limited to these crops.

On the other hand, responding to direct demands of women's groups may not always be the most effective gender approach. While some of these groups include initiative-taking women, e.g., *Coeurs Unis* (PADF Cap Haitien), which also has one male community leader as a member, others organize very small-scale handicraft activities, reinforcing the Haitian societal pressure on women to focus only on child and house care, without providing them additional skills or economic resources. Progress is being made, however. The team saw a women-owned coffee cooperative in Camp-Perrin supported by PADF. In addition, PLUS support to marketing is often creating employment for women as hillside produce is being transformed in the rural areas for shipment to urban markets.

E. Technologies

1. Soil and Water Conservation

Many of the same technologies in support of agriculture on hillsides are being promoted by a variety of organizations and projects in Haiti. Practices aimed at conserving soil and water include 1) hedgerows and/or alley cropping; 2) rock retaining walls; 3) checkdams in ravines (gully plugs) made of rocks or dead vegetation; 4) straw barriers made by staking dead vegetative matter along the contour; and 5) contour ditches. Most NGOs and donor-funded projects with agriculture components extend one or more of these techniques. The techniques do seem to achieve significant

results, in terms both of soil conservation and of eventual increases in crop yields, on those parts of fields protected by such structures. The exact extent of these results, however, tend to be poorly quantified.

Among introduced technologies, hedgerows are popular in those areas in where farmers are managing them properly. When animals are kept out of the hedgerows, the structures are efficient at conserving the hillside soils from erosion. Catholic Relief Service (CRS) and the Baptist Mission agronomists state that hedgerows are one of the best-accepted soil conservation techniques. Hedgerows with leguminous tree species such as *leucaena* and *gliricidia* are widely promoted by a number of projects. Farmers in many PADF regions have chosen to replace these tree species with food crops (pineapple, manioc, etc.) to form what they call *ban mangé*.

Vetiver grass, which successfully protected steep slopes in Honduras during Hurricane Mitch, may have promise as a species to be planted in hedgerows (Thurow and Smith, 1998). It is easy to establish, hardy, broadly adaptable species that are resistant to disease and insects. It has rigid leaves to slow surface flow and trap sediment. And it has strong roots with limited horizontal growth and thus competes little with crops. Haitian farmers, however, may be less interested in vetiver than in vegetative strips with useful food or forage crops. In addition, vetiver grass terraces were once rejected in Haiti because high essential oil prices encouraged farmers to uproot the plants, actually encouraging erosion.

2. Livestock

Essentially every farmer involved in hillside agriculture around the world has livestock; Haiti is no exception. Livestock are widely dispersed throughout the Haitian hillsides and are an important element in the balance of the farming system and household income. Farmers request assistance in caring for their livestock. The team observed a variety of livestock including free range chickens and turkeys, and tethered cattle, goats, sheep, horses, mules, donkeys and pigs. Some of the animals observed were penned; the waste from these animals was used in the family garden. No smaller ruminants were seen but we heard that a few farmers keep rabbits.

The USAID-funded projects eschew livestock interventions. Most hillside projects, such as those support by CRS, the EU-financed PRESTON project, and the French InterAide project, involve a livestock component. The interventions range from livestock management, veterinary support and the introduction of more efficient breeds.

The team found there were three major reasons why livestock is not more widely addressed by projects:

- Destruction is caused to soil conservation structures by heavier animals when they walk or climb over hedgerows and stone walls.

- Hillsides have been over grazed, due to improper management, further deteriorating soil conservation. (This especially occurs when areas are put into a traditional fallow. The land is left uncultivated for a season in order to regenerate, however, cattle and goats are allowed to graze often eating the remaining vegetation down to the roots.)

- It is costly to offer veterinary services to needy livestock.

However, livestock is an important element of the farming system and is often the critical cash reserve families use in the event of a crisis. As in other countries in the developing world, livestock represent the family savings account.

3. Improved Germplasm

Many NGOs and donor-funded projects have supplied improved seed and have introduced new varieties to hillside farmers. An inventory of crop varieties grown —or with potential—in Haiti identified more than 80 varieties of improved staple food, vegetable and fruit crops (Azael, 1994). Many of the introduced varieties, particularly commercially available vegetable varieties, have gone directly into extension programs with little or no tests of their adaptation. Evaluation of their performance and subsequent retention or abandonment by farmers and projects has been on an *ad hoc*, hit-or-miss basis.

The international agricultural research centers that comprise the Consultative Group for International Agricultural Research (CGIAR) serve as repositories of improved germplasm for food, vegetable and tree crops and disseminate a vast array of improved varieties. Some of these varieties have already been tested in and/or successfully introduced to Haiti, e.g., potato varieties from the Centro International de Papa (CIP), tree varieties from the International Center for Research in Agro-forestry (ICRAF),

Only high revenue trees such as commercial quality fruit trees survive hillside deforestation. It is pure economics. Trees which earn between $25 and $100 per year are too valuable to lose, especially when average income hovers around $200 per year. (ORE, 1998) Transforming low quality fruit trees by grafting is clearly a simple way of protecting the environment while increasing farmer revenues.

and bean and manioc varieties from *the Centro International de Agricultura Tropical* (CIAT). These centers are always ready to collaborate with national programs and projects in the testing and introduction of improved varieties. There have been a number of missions in the past few years from CIAT, expressing interest in playing a more active role in Haiti. During our meetings with CIAT representatives, it was resolved that CIAT would increase its role in supporting the introduction of bean germplasm in the near future.

4. Indigenous Agro-forestry Practices

Agro-forestry plays a large role in hillside farming systems and management options are particularly diversified. A survey of agro-forestry practices in the Petite-Rivière de Nippes commune has identified 17 different strategies of plot management (Garrigue,1992). Indigenous practices play a strong role in these labor, asset, and cash flow management strategies. None of the projects analyzed indicates a specific effort to integrate the proposed innovations into farmers' existing practices, except for the newly begun Canadian agro-forestry project in South Department. For the most part, project personnel don't work closely with farmers to set up the interventions in the farmer's plots.

In a recent ASSET report addressing hillside soil and water conservation issues in the project area, Joel Timyan (1999) concluded that direct seeding is a very viable and faster alternative to fruit tree propagation. His initial research concluded that over 20% of the trees in Haiti are directly seeded with over 45% of fruit trees planted this way. Seed trials are being planned under ASSET. Direct seeding of trees and grasses would accelerate the rate at which the watersheds could be provided with vegetative cover to protect the fragile hillsides against wind and water erosion. Depending upon ASSET's results, this could be an important way accelerate tree seed introduction into Haitian hillside agriculture.

F. Technology Transfer and Adoption

1. Effectiveness of Current Technology Transfer Methodologies

In the absence of a functioning state extension service, most organizations in Haiti have found some way of establishing the equivalent by working with farmer groups. These groups include those already formed for some other purpose in the past, or—less frequently—groups organized specifically to attain the purposes of an organization's project or program. Groups typically nominate one of their members to work with the project as a field agent. The NGO then trains the group's nominee, who later receives some sort of stipend. The stipend comes from the project, but is usually paid through the group. To qualify for nomination as a PADF or CARE

field agent, a person must be a farmer, be able to read and write Creole, and be a stable, responsible member of the community.

For the extension of soil and water conservation (S&WC) practices, farmers are usually provided some sort of in-kind incentive. In the PLUS Project, for example, to receive improved seed or improved germplasm, farmers have to plant the seed or seedling on land protected by a project-promoted technique. To receive any sort of help with cassava, including assistance in marketing *cassave*, farmers have to agree to grow their cassava behind a soil-conserving structure, such as a rockwall, that they and their neighbors build with project personnel assistance.

It had been reported to the assessment team that there were important differences between CARE and PADF in the extension methods used. The assessment team has not found those differences to be significant enough that one is appreciably more effective than the other. The method of working with farmer groups through field agents from and paid by the group, and of motivating farmers to adopt conservation techniques by linking provision of income-generating technologies or services to that adoption is a common one. The team found anecdotal evidence that the success of this method, developed over time in the AFII and PLUS projects, has influenced its use by other projects and NGOs. It appears to be an effective method, at least within project boundaries, i.e., within areas actually covered by a field agent.

2. Rate of Adoption for Technologies and Reasons for Non-adoption

There is evidence that levels of adoption of improved technical practices within PLUS project boundaries are significant. From the 1994 Baseline survey in 16 PLUS project M&E sites, almost one third of a random sample of farmers had adopted at least one of the recommended S&WC practices. Other agricultural programs run by NGOs report "good acceptance" or "widespread adoption" of the same or similar technologies within their project areas.

Grafted citrus and mango trees continue to be one of hillside farmers/ most lucrative crops as they average over $100 a year per tree. Out-of-season avocado varieties, such as *Chocquette* and *Lula* also hold potential value. As they bear fruit several months after the traditional avocado season is finished, their fruit sell for premium prices. (ORE, 1998)

Lea (1994) found that 70% of the farmers in the Northwest Department had adopted at least one of the conservation interventions. The stubble barrier was the most common technique adopted because the materials needed were readily available. Vegetable gardens and hedgerows were also popular among farmers in the northwest.

Exact rates of adoption are difficult or impossible to estimate in the absence of on-going collection of M&E data necessary for that estimation. An adoption study has been completed by PLUS/PADF, with collaboration from 20 Haitian *stagiaires*, SECID and Auburn/Soil Management Collaborative Research Support Program (CRSP). This survey specifically included

secondary adopters and non-adopters. The data are at Auburn University, and preliminary results are expected soon. Earlier collection of the necessary data appears to have suffered from lack of sufficient resources. There is a widespread belief among those working in the hillside sector that USAID-funded projects in particular were encouraged to produce and quantify large number of outputs, to the exclusion of adequate collection of the kinds of data needed to eventually quantify adoption rates, adoption patterns, and impact.

In general, those soil conservation techniques which require more time and labor (rockwalls and stone gully plugs) or more management skill (hedgerows) achieve quicker and more lasting results than vegetative or stubble barriers. There is considerable acceptance by farmers when they are

exposed to demonstrations of these techniques implemented by their peers, followed up by project

extension support. Acceptance of any particular technology varies considerably from region to region.

There is considerable anecdotal evidence of cases of widespread adoption of one or more improved varieties, although the particular varieties vary from region to region. A few field crop varieties have achieved significant acceptance in at least some areas. These include the banana variety “FIHA 01”, resistant to black sigatoka; the bluggoe plantain variety “FIHA 03”, resistant to *Mal de Panama*; the cassava variety “CMC-40”; and the bean variety Tamazulapa. Fruit tree varieties with good adoption as the result of various project-based extension efforts include the avocado “Choquette,” and a relatively small number of mango varieties- *francique* appears to be the most common. A host of commercially introduced vegetable varieties have been or are being adopted, either on a commercial scale, e.g., in the Kenscoff area, or through project based improved home garden initiatives.

Hillside farmers operate under a number of constraints—in addition to those cited above—that might inhibit their adoption of interventions. Other constraints faced by hillside farmers include risk aversion (they operate on a small margin for error and they choose to stay with strategies that have worked in the past), time constraints, and limited financial wherewithal for investments. All of these factors will slow the rate of adoption.

Another reported problem complicating adoption is that of incentives to farmers. One person observed that it is very difficult to get farmers to adopt a new technology when others are paid to adopt it. Some NGO and donors are giving away tree seedlings and field crop seeds to farmers and asking them to distribute a like amount to non-project farmers to spread the benefits. This is easier with field crop seeds, but is not possible in the case of hybrid vegetables. Further, there is also appropriate information which must be conveyed before the technology can be used effective (pruning for tree grafts and water management for vegetable seeds).

In 1966, the first rock retention walls in Haiti were promoted by the Baptist Mission and built by vegetable farmers in the highlands near Kenscoff, and are still accumulating eroded soil for the past 33 years. Subsequent construction of rockwalls in the same area was organized by PADF through a USAID employment-creation project. This technology today has been used by more than 5,000 vegetable farmers near Kenscoff and indirectly reached nearly 200,000 vegetable growers in the periurban highlands of Port-au-Prince (Wally Turnbull, personal communication).

The CIDA (Howard, 1998) report suggests that strategies and interventions must be simple, require little investment, and generate money immediately. These interventions must also be adaptable to a wide variety of situations concerning tools, material, and water availability.

Mr. Turnbull's rockwall story depicted three essential ingredients for successful transfer and diffusion of new soil conservation technologies in Haiti and elsewhere, namely: 1) initial capital investment for establishment and demonstration; 2) availability of inputs (in this case, both rock and labor are readily available locally); and 3) the growing of high value crops for a nearby large urban market. Furthermore, a recent study conducted by SECID has indicated that rockwalls are economically feasible even in the dry areas of northwestern Haiti, where low value crops such as sorghum and pigeon pea are grown.

Reactions from both farmers and project personnel regarding adoption of vegetative barriers, such as, hedgerows or alley cropping seem less consistent. CARE project personnel interviewed by the assessment team showed less enthusiasm for this technology than did PADF project personnel. The team saw substantial areas of slopping lands near Camp-Perrin and other PADF areas planted with leucaena hedgerows. Camp-Perrin farmers seem well aware of the various functions and benefits of hedgerows. They recognize the need for high labor input in pruning and management, especially during the dry season when the lands are used for grazing. The team observed, however, that pruning height of some of the hedgerows may be too low, which may hinder rapid regrowth.

3. Secondary Spread of Technologies

With the exception of improved varieties, there appears to be little farmer-to-farmer spread of introduced technologies outside of (PLUS or other) project areas. In any event, there is little hard evidence to document such spread. Possible reasons for this lack of spread are discussed above and in the *Conclusions* section below.

It should be noted here, however, that many of the technologies specifically aimed at soil and water conservation require a concerted extension effort, through demonstrations and/or technical advice and support. These are not technologies which "sell themselves." Even those technologies more susceptible to farmer-to-farmer diffusion sometimes also require a certain

amount of education in order to ensure effective spread. Introduced varieties and improved seed, for example, are often mixed with local materials, either in the field or after harvest, thus diluting or losing entirely their yield potential. Farmers must often be made aware, and then reminded, of the benefits of conserving germplasm integrity from harvest to harvest. Similarly, information on proper pruning must accompany training in tree grafting, and information on proper water management is important to the success of vegetable gardens.

4. Agricultural Training and Education

Hillside agriculture is a focal area of concern in Haiti's among training centers and research stations. Themes include soil fertility and conservation, tree planting and agro-forestry. The national watershed management training center in Limbé (Cap Haitien) has five trainers and has been operating continuously since 1980, with a modest budget. The Damien agro-forestry school *(École*

Moyenne d'Agroforesterie) operated for only one year in the early 1990s and is now resuming activities under the ATPPF project.

Occasionally private sector firms have trained Haitian extension and marketing personnel in improved production and marketing techniques. M&M/Mars, a major buyer of Haitian cocoa, in conjunction with the PLUS project, recently financed a trip of an international cocoa expert to design a number of demonstration trials to promote improved, cost-effective cocoa tree management techniques which will significantly increase production. In addition, at least one local private agricultural input supplier conducts demonstration plots to promote improved seeds and inputs for field and vegetable crops.

G. Applied and Adaptive Research

1. Current Situation

Efforts in Haiti to support development of the hillside agriculture sector with applied and adaptive research have been less consistent over time than in other parts of the tropics (particularly in Asia and in Latin America), where development of agriculture has in fact benefitted greatly by such research. In part, the fitful, stop-and-go support by donors of adaptive research has been due to economic, political and security realities beyond the control of donors. To some large extent, however, adaptive research in Haiti has suffered over the past decade from the willingness of many donors to allow themselves to be swayed by changes in what can only be called fashions in the donor countries.

Centre de Recherche et Development Agricole (CRDA) remains the chief source of research expertise on the part of GOH. It suffers from severe shortage of resources. In consequence, the

institutional landscape is becoming a mixed one in which the GOH plays a reduced role, NGOs and PVOs remain the main players, and private sector firms are more active. Salagnac, a major regional research center, ceased research operations in 1991, but may begin again under a new Canadian agro-forestry project. There are several private universities—Quisqueya in Port-au-Prince, being the major one—and at least one Haitian PVO (ORE, Les Cayes) doing some research. The few viable agribusiness companies in the country play some role in the introduction of crop varieties. Under the proposed PIDA (Sustainable Intensification of Agriculture Project), the World Bank is considering support to regional research and extension through foundations with boards representing a mix of regional stakeholders. Particular emphasis would be given to input supply and land and water management.

Adaptive research to improve crop production systems, including protection of the productive base of those systems (i.e., soil and water), has not adequately included study of the crop-livestock

interface. The few past interventions in the Haitian livestock sector have been in improvement of breeds, animal nutrition, and animal health.

2. Benefits of Past Research Activities

Hillside agriculture in Haiti is exceedingly diverse. One reason for this diversity is to protect limited-resource farmers from risk (Romanoff, *et al*, 1995). Adaptive research can evaluate technologies—and help predict their eventual adoption—across this broad range of diverse environments, thus improving the efficiency of technology-based efforts to increase farmers' incomes. (Annex E contains a list of USAID/Haiti funded adaptive research publications.)

In contrast, the widespread adoption of improved potato varieties in the Kenscoff area, is the result of years of continual testing/extension collaboration between MARNDR and the Baptist Mission in Fermat. It is perhaps instructive that the work with potatoes in that region, as well as the highly successful introduction of improved vegetable varieties, is the result of several decades of sustained effort.

Even though inconsistent over time, past applied and adaptive research in Haiti has produced results. Much of the work has been on the testing of performance and adaptation of improved varieties. In the case of USAID-funded projects, high-yielding varieties of several crops were identified under the PDAI project in the early 1980s. Goat husbandry research under the Targeted Watershed Management Project indicated that Haitian farmers might in fact accept confinement of improved breeds if adequate feed gardens could be established.

Dozens of applied and adaptive research trials were conducted under AOP, AFII and PLUS, often

in collaboration with GOH (primarily CRDA) researchers. Much work was done on tree germplasm improvement and seed production. Species studied included neem, *Casuarina*, *Catalpa* (Haitian oak), tropical cedar, *Senna siamea*, *Cordia alliordora*, pine, gliricidia, and mahagony. In addition, considerable research was begun under PLUS—by CARE and PADF as well as by SECID—on field crops. This research included multiple-year trials on bean, cassava, sweet potato, maize, peanut, and cowpea. Results for much of the tree and field crop research have been published as PLUS reports. A list of these reports is contained in Annex E.

Some reports, such as the *PLUS Project Report No. 23* on the impact of tree planting from 1982-1995, document not just the considerable outputs of that effort, but also include valuable insights into farmer behavior relevant to understanding of farmers' adoption of agro-forestry and soil conservation practices as well.

In contrast to research on improved varieties and on soil and water conservation methods, comparatively little crop management, crop nutrition, or cropping systems research has been done.

Research on the crop-livestock interface—potentially of great importance to improvement of Haitian hillside farming systems—has also been neglected.

One short-coming of some of this research, at least for field crops, has been a tendency to repeat the same trial over too many years, before moving on to extension- or farmer-managed trials with many more participating farmers. Too much emphasis has also been placed on measurement of traditional agronomic variables and not enough on characterization of on-farm environments. Unfortunately, there have been many more outputs from past research—potentially very valuable outputs—than there are clearly documented, tangible benefits to farmers. In the case of almost all of the USAID-funded research cited above, support to the research was cut off or suspended before the results could be translated into useable recommendations and extended to farmers.

One piece of work with potential for increasing the benefits to be realized from adaptive research was done under PLUS/SECID (Rosseau, 1993). This work indicates that there are significant yield increases due to hedgerows on steeply sloped hillsides. It identifies simple, practical methods of measuring and predicting the actual conservation of soil, increases in crop yields, and decreases in farmer risk (through stabilization of incomes) associated with hedgerows. It is, unfortunately, still in the form of a dissertation, and needs to be translated into a more accessible format to be useful. Similar methods could be developed for better estimates of the actual benefits of other soil conservation structures. Other methods for simple measurement of improvement to overall soil productivity were proposed by M. Douglas (Romanoff, *et al*., 1995).

Experiments on alley cropping in Haiti have been conducted for a number of years under PLUS/SECID and by Auburn/Soil Management CRSP. Preliminary results from one experiment involve 12 cropping seasons of continuous maize cropping. These results indicate that without fertilizer input, maize yields are sustained under alley cropping, decline gradually in a rockwall-

protected field, and decline rapidly in a field where no soil conservation measure is used. This research, however, was conducted on only one type of soil, and only with maize. More systematic adaptive research will be undertaken by the soil management CRSP, possibly with collaboration from PLUS personnel (Dennis Shannon, personal communication).

Inadequate technology validation contributes to slow rates of adoption and diffusion. For example, little adaptive research has been conducted in Haiti regarding the performance of vegetative barriers (hedgerows) with respect to tree species, soil type, elevation and cropping systems, pruning height and frequency. *Leucaena* is known to be well-suited for calcium-rich soils derived from limestone, but is not suited to strongly acidic soils, or to phosphorus-deficient or phosphorus-fixing soils. In the latter cases, suitable species of legume and non-legume trees must be selected and evaluated for hedgerow establishment. Judicial use of phosphorus fertilization may be required initially.

Although progress has been made in convincing a significant number of farmers in project areas to establish soil conservation measures in their fields, little attention has been given to identifying the specific determinants required for transfer and diffusion of these technologies to other project areas. Biophysical information necessary include soil type, slope, plant performance, crop yield, water runoff and soil erosion. Collection of this information, at least in a small number of representative benchmark sites, may be more important in the long run than wide-scale measurement of project output in terms of total length of rockwall installed or hedgerows planted. Soil productivity is a more important determinant of increased revenues than is soil erosion itself.

Baseline surveys made available to the assessment team contain primarily social and economic information. They contain little or no information on soils, hydrology, topography and vegetative cover. This biophysical information is essential for planning and designing adaptive research, technology diffusion programs, and even more so for planning and implementing watershed management programs. It has been reported that most recent systematic inventory of soils, vegetation and state of land degradation was completed in 1960 with funding by the OAS. This inventory had two important findings. First, no Haitian soils could be cultivated without the help of some forms of soil conservation techniques (i.e., the same conclusion reached over 30 years later by the IBRD). Second, over half of Haitian soils are either situated on steep slopes or too shallow and ill-suited for conventional food crop agriculture, except where slope and top soil depth permitted tree crops such as coffee and cocoa.

A major, and continually useful, output of USAID-funded research was the series of PLUS reports on the rapid reconnaissance surveys conducted in PLUS Project areas by Swanson et al. (1994). These reports helped in planning the research and extension activities of CARE, PADF and SECID, and—if adequately disseminated--can greatly aid others working in the hillside sector

as well.

3. Monitoring and Evaluation

Discussions with project management staff from a number of hillside projects, indicate they feel their M&E programs are insufficient to accurately measure impact or monitor project progress. Most people interviewed said their projects had insufficient funds to hire the necessary staff to perform the needed work. CRS, however, reports that they do a good job of monitoring impacts because they established an excellent baseline study and they have a more scientific approach in collecting project data (sampling farmer output and measuring actual kg output per kg input). The team was not given any reports to support this claim, however.

H. Marketing Systems and the Development of Hillside Agriculture

White and Jickling (1995) argue that all conservation methods are profitable for most plots, but the key to developing hillside agriculture is to improve the marketing system. Through marketing system improvement, net prices to farmers will increase and net farm income will be enhanced. Metzler (1999) and Jolly (1993) made similar claims.

A variety of NGOs have been involved for a long time in providing inputs, particularly seedlings, to farmers. These provisions are usually on a modest scale and they are not managed on a commercial basis. For example, FLO (*Familles libres organisées*) near Cap Haitien is reportedly the second largest tree nursery in the country. The nursery, founded by the Haiti Evangelical Church, has operated continuously since 1965 and has employed the same two technicians for 20 years. PADF has been practically their only client since 1995. Organization for the Rehabilitation of the Environment (ORE) is an NGO which also sells its seeds and seedlings to donor projects. These two organizations will need to operate on a fully-commercial basis in the future as project activity dwindles. CRS gives its vegetable seeds to rural communities involved in their projects. These organizations in turn repackage and sell them to their membership, establishing revolving funds in order to buy future stock.

The CIDA (Howard, 1998) report stated that there must be ways of reducing transactions costs in the Haiti if economic efficiency gains are to be realized. Transportation systems are certainly a key to reducing transactions costs. According to Jolly (1993) it takes an average of 20 minutes per mile for trucks to traverse rural roads. Livestock and human power are the major transportation means for farmers, since they usually sell their produce in the villages (Jolly, 1993 and Lea and Riviere 1994). Commercial crops, such as coffee, cacao, plantain, and mangos, are often consolidated and trucked from the secondary markets to larger markets by private traders.

The presence of numerous small-scale traders is responsible for having created generally cheap and relatively efficient marketing channels for consumable goods and domestic agricultural commodities, despite difficult transportation conditions. As an example of this efficiency, some of these more successful *Madams Sara* (rural women traders), have started to sell seed and fertilizer to the producers of the crops they transport to market.

Agricultural output prices vary tremendously within and among regions, but the lack of market information deters arbitrage from reducing price variability (Jolly and the various works of Swanson, 1993). They argue that is no evidence of imperfect competition or price gouging for food crops, but the poorly developed infrastructure does not allow the marketing system to smooth out these price differences. The *Madam Sara* system is efficient in that the participants are not making large economic profits (Metzel, 1999 and various works of Swanson), but their margins are still high because of the risk involved (*Madam Sara* might lose money on their transactions because they buy in one place without being certain of the price they can receive) and the lack of reliable market information.

One reason for these wildly fluctuating prices is that farmers tend to sell their product at harvest, when prices are at their lowest. Lea and Riviere (1994) estimate that 78% of cereals, 81% of beans, 73% of tubers and 88% of fruits are marketed at harvest. This is consistent with the findings of

various reports by Swanson (1993). Selling products at the median price during a season would increase revenue from 50-96%.

1. New Marketing Ventures

ServiCoop, a cooperative formed under and supported by the PLUS project, has been purchasing coffee and cacao for export from farmer cooperatives and associations. ServiCoop's entry into the market has reportedly increased the prices that the three coffee and three cacao exporting companies pay to farmers. The benefits of this entry has been estimated at $750,000 for cacao during the first year alone (Lea 1998, Semi-annual Report). SECID is working to assemble and transport mangos for the export market. SECID's marketing efforts have lead to at least a 50% increase in the farm-level price of mangos, generating an estimated $32,000 benefit to mango growers during 1997/98 (Lea 1998).

ServiCoop has been working to enter the Fair-trade coffee market in the European Union (EU), which will allow them to obtain a premium over the world price. They have also been working on organic certification programs for mangos and coffee (these programs will pay an estimated 15% premium). These are some examples where activities to improve the marketing system and product identification process can result in higher farm-level prices.

Under the impetus of the SECID marketing programs, the PLUS project is encouraging its groups

to add value to their produce by promoting on-site processing of plantains to reduce transportation costs for the varieties that are made into flour. Cassava flour is also being produced and bananas are cut and dried for shipment to and sale in urban areas. There is also potential for mango processing into dried chips and puree for the domestic market. These are examples in which people have identified ways of overcoming the transportation problems through introducing new product forms to create on-farm, value-added industries. This incipient food transformation industry also increases off-farm employment possibilities, primarily for rural women.

2. Private Sector Development

Direct entry of project participants into the marketing system is a controversial issue, particularly if project participants receive a subsidy which allows them to have plant and equipment to compete with the private sector. In some cases, the private sector is dominated by powerful family-owned cartels that have great market power and have received large profits by forcing producer prices down (this is particularly true in coffee and cacao). Entry of a new player into the marketing system, whether it is ServiCoop or some producer cooperative, will make the market more competitive (as
Metzler, 1999 argued) and force produce buyers to increase their price offers. This can generate tremendous income gains for hillside agriculture.

An earlier assessment carried out under the PLUS project recommended that marketing activities should provide support services to existing micro-entrepreneurs (SECID/AUBURN 1995). In the marketing sector too, the overall objective of such projects should be to identify promising entrepreneurs (individuals, cooperatives and larger-scale market operators) and nurture their growth. This necessitates the delivery of three different services: information, training, and support to enterprise creation.

Project activities and the marketing elements of these activities should always keep the ultimate objectives of the project in mind. At this time, these objectives are to increase the income of hillside agriculture and preserve the environment. In most countries of the world, agricultural development is promoted by a vibrant, efficient private sector which can perform many of the marketing functions in a way that will lead to high prices for producers and maintenance of product quality throughout the marketing system. In the long-run, Haiti will not be served by development of a broad, multi-product behemoth that controls the marketing of all major agricultural products.

3. Price Biases Against Export Crops

Haitian agriculture suffers from price distortions caused by GOH policies. Export crop prices

Many of these same factors tend to reduce the price of exportables in Haiti. High transportation costs and port charges reduce the farm-level price that is offered to coffee, cacao, and fruit producers.

are too low relative to other crops, particularly importable crops (Metzel, 1999). Staple agricultural products, such as maize, sorghum, and beans, are considered importable because it is easy for Haiti to import these products from other countries (particularly the U.S.) Importable prices are high because of Haitian customs and other import duties (the net import fees are 21% for maize and sorghum; 11% for beans; and 9% for rice)[1], port fees, and internal marketing costs in Haiti. Port fees, which are among the highest in the world according to Metzel and the APAP technical report, force imported cereal prices up. The high costs for transportation mean that prices for importables are further uplifted in the hillside areas, encouraging farmers to grow these importable products[2].

Export duties on these products have been rescinded, so there is no distortion in prices due to border measures for export crops. Yet, the small number of exporters for coffee and cacao likely further depress farm-level prices and discourage production of these crops. However, some of these

distortions which encourage production of importables are not associated with GOH port charges or a distribution system that is hampered by poor roads. The import duties are a GOH price policy and it has been estimated that fuel taxes account for 39% of transport costs (Metzel, 1999). It is interesting that when environmental concerns for hillside agriculture are added to the economic analysis, the pricing system should place a premium on export crops. That is because many importables (particularly cereals) have negative externalities because of soil erosion (their price should be lower because their production causes problems for other agents in the watershed). The effect of these GOH policies and other distortions is to discourage production of export crops because the prices of staple cereals are 20 to 45% above what they should be.

The pricing and marketing system in Haiti makes the prices of importable crops (such as maize, sorghum, beans, and rice) higher relative to exportable crops (such as coffee, cacao, and fruits). This discourages production of exportable crops where Haiti has a comparative advantage. The major reason for this distortion is the substantial rates of protection on importable crops. Some of the reasons for the high relative prices for importables is artificial and these distortions only serve to increase the price bias toward importables. These artificial distortions were reduced in

[1]The major part of these import costs are customs duties, which are 15% for maize and sorghum, 5% for beans, and 3% for rice. There is also a verification tax (4%) and an account tax (2%) on each of these items (Metzler, 1999). Additionally, a 10% TCA is collected at port-of-entry and the "quitus fiscal" must ve obtained by all traders from the GOH Tax Directorate (DGI) before they can import or export. (Truong personal communication)

[2]Smuggling of importables into Haiti will tend to undermine the effects of the import duties, lowering the price of importables. This might mitigate the upward bias in the price of importables in certain areas.

April 1995 when the import duties on maize, sorghum, and rice were 50% and the customs duty on sugar was 20% (IMF RED Report, 1999). However, if Haiti joins CARICOM, the customs duty for all of these products will be increased to 20% for all imports from non-CARICOM countries, unless the GOH succeeds in its insistence upon lower rates.

Most of Haiti's exportable crops are more environmentally friendly and therefore their production should be encouraged through the pricing system. The price bias for exportable crops which result in environmental damage due to their production, such as cassava and yams, is less clear. One must consider their loss in environment against the downward bias in their market price. It is not clear whether production of these crops should be encouraged beyond their present levels

According to farmer interviews, when the export market prices fell for coffee, cacao and mangos, many hillside farmers cut down their trees and created charcoal of them for sale.

4. Farmers as Consumers

An important distinction is necessary between agricultural income and rural income. The fact that farm families have many sources of income, agricultural production being only one of those sources, is crucial. Hillside farmers need this supplemental income to pay for services (schools fees, e.g.,) and purchase items they require but cannot produce. The BARA baseline study (1994) for the NW estimated that only 22% of rural incomes come from agricultural production, while 9% came from agricultural wages, 13% came from livestock, and 28% came from petty commerce (exporting agricultural and forestry products from the rural areas and bringing back consumer goods such as soap, canned foods, etc.). Rural households produce only 28% of the food they consume (Wiens and Sobrado, 1998). Baron et al.(1997) claim that the majority of farmers are net buyers of food. The

BARA baseline study found that the average rural household spent 3254 gds/year on food (56% of that on cereals and 23% on meat), while total household expenditures were 6409 gds/year.

I. Impacts of Project Interventions and Technologies

As with assessment of adoption, assessment of the impact of technical innovations on increasing incomes is hampered by the lack of hard data necessary to make an accurate and relevant judgment. In particular, the monitoring of accurately measured yield increases has not been given sufficient attention.

The long-term involvement of hillside agriculture projects in tree planting has led to the emergence of several modern forestry nurseries and a large number of competent, motivated farmers. This has allowed the maintenance of parental seed gardens and a system for seedling

production and tree grafting. Few of these nurseries, however, have a sustainable enterprise base. Farmers are willing to pay for quality tree seedlings and are already paying to purchase some improved vegetable and field crop seeds from the market, as is evidenced by ORE's clients and CRS's participating farmers.

In the case of the PLUS project, many of the estimates for both baseline and post-intervention yields has necessarily relied on farmer recall data due to funding constraints. Although recall data are better than nothing, this sort of data is much less useful than actual yields regularly and consistently measured in the field, both for the purpose of assessing impact and for analyzing farmer acceptability and further potential for adoption.

Other projects on the hillside sector, for example, some CRS agriculture projects, indicate that they do include actual measurement of yields from randomly selected farmers as part of their M&E process. In some cases, however, there appears to be a "preselection" of farmers before the process of "random" selection, so the samples may not be truly representative and the sample size might be very small.

1. Economic Benefits of Adoption

There are a number of economic analyses using farmer-recall yield data, collected by the PLUS Project. Lea (Case Studies Returns) and Lea (PADF Program Benefits and Costs) generate net present values for many interventions. In both analyses, hedgerows are assumed to increase yields by 50%. In the Case Studies report, gully plugs are assumed to increase yields by 100%, whereas they are assumed to increase income by 200 gourdes per year in the PADF Program Benefits and Costs. Rockwalls are assumed to cut the yield decline from 18-27% per year, to 12% per year in the Case Studies report. Rockwalls generated an estimated internal rate of return (IRR) of 90%.

White and Jickling (1995) use crop budgets and yield estimates to arrive at their benefit/cost ratios for soil conservation interventions. They assumed that hedgerows and rockwalls increased yields

22-28%, while gully plugs increased yields by 50%. Again, these yield increases were not well documented. The IRR for hedgerows and rockwalls exceeded 50%, while the IRR for gully plugs was approximately 50%.

Lea (PADF Program Benefit/Cost Analysis, mid-term report, 1999) estimates that improved seeds distributed through PADF activities generate a 50% yield increase for most food crops, with the

lone exception being disease-resistant banana suckers which increased yields by 25%[3]. Lea also found that improved fruit trees generated 20 dozen mangos per tree after four years and that each branch from a mango tree graft increased fruit yield by 12 mangos per year after three years. All of these technologies generated very high rates of return. The results have been so good that the CIDA report argues that tree crops are the answer for Haitian hillside agriculture.

2. Sustainability of Activities

The sustainability issue is complicated, especially given the weak GOH infrastructural support to hillside agriculture. The team observed projects that derive sustainability mainly from the development of local human resources and institutions (in the broad sense), not from technology transfer alone. Donor-funded hillside projects both sustain their long-standing, successful partnerships, and seek additional partnerships with Haitian NGOs which have a long-term involvement in the hillside sector. USAID did so during the 1980s. The European Union funds programs of micro-projects in Haiti; each is implemented by an NGO. For example, the Rural Rehabilitation Program has integrated hillside development components.

Other than encouraging local NGOs to carry out developmental activities, few hillside development projects had cost recovery or other means of sustaining hillside improvement activities incorporated in their designs. The question of sustainability was answered by the assumption that farmers would see the value of adopting the improved technologies and would thereby increase their revenues and
conserve the hillside environment. The implication was that until they did, donors and NGOs would continue to provide support in perpetuity, due to likelihood that the weak GOH extension support would not be able to fill the void. However, there are a few donor and NGO-sponsored projects that successfully charge farmers for seeds and services with the intention of developing revolving funds for a sustainable supply of these inputs.

[3]Lea argues that 100% is more reflective of true yield increases, but he wanted to be on the conservative side in calculating project benefits.

III. CONCLUSIONS

A. Institutions Involved in Hillside Agriculture

In the absence of functional governmental extension institutions, individual projects, funded by a variety of donors and NGOs, have developed institutional arrangements and cultures to fill the void. In addition, neighboring countries with similar farming systems have agricultural extension systems with quite varied institutional settings and methods.

PLUS project approaches in Haiti, however, are much more similar than is commonly reported. For example, there appears to be as much difference among regional project areas within PADF as there is between PADF and CARE. The services delivered to farmers by these two organizations differ mainly in the selection of project areas and in farmer training methods.

The GOH has enacted laws promoting decentralization of authorities from national to local levels. However, little funding was obligated to make this transition effective with even departmental personnel starved for human and financial resources. Until there are substantially more resources going into the MARNDR and the MDE, there can be little expectation that they will play a major role in supporting the development of hillside agriculture. It is clear that there must be more GOH technical expertise at the department-levels and more support funds if these ministries are to be successful in the hillsides. However, this does not seem to be a feasible possibility, at this time.

The private sector is already providing some market information through radio transmissions. More is needed. The IDB loan for agriculture marketing support should help alleviate this deficiency. The market information disseminated could influence farmers on which crops to plant, when to harvest, store and market their produce, and could help farmers obtain higher farm revenues. It would have a positive influence on Haitian farmers and markets as it has been in other developing countries.

Project implementers must take great care in making sure that collaborators are overcoming the social and political problems associated with past Haitian groups. Donors would not like to find that associations, *groupements*, or other organizations used in the projects are a means for the local elite to increase their incomes and presence in rural areas. This is also true in working with farmer cooperatives, which may have unintended consequences with respect to women. Cooperatives tend to be associated with men, especially when their outputs are more commercially oriented, as in cacao, coffee, or other cash crops. This might undermine the role of women in the agricultural system, which would be another unintended consequence.

B. Project Activities

Most projects in Haiti have devoted a substantial part of their resources to staff and logistics. As CBO-based management systems are established, the proportion of project costs directly transferred
to farmers should increase markedly. Projects which have expertise in input delivery could supply larger quantities of more diversified inputs, including tools, cement or young animals. A few of donor and NGO-sponsored projects charge farmers and, with the proceeds, develop revolving funds for a sustainable supply of these inputs.

Unlike farming on flat lands, soil conservation interventions on sloping lands must be planned, designed and implemented on a watershed basis under various levels of resolution, depending on the size of watershed and catchment in question. The drainage pattern of a watershed, large or small, forms the framework of energy flow and nutrient cycling within the landscape unit. If planning does not occur at the watershed level, activities on a smaller planning unit (e.g., a farm or field) could be undermined by events outside the project's control.

Water micro-conservancy is an essential investment in Haitian hillsides for both drinking water and the development of higher-value crops. However, it also requires specific qualifications to ensure sustainability of the works. Credit for water conservancy should be undertaken under specific projects or components.

Integrated approaches addressing the farming system's needs appears to be successful in encouraging broader participation and adoption of improved technologies.

Participatory projects face the difficult task of responding better to farmers' demands, while avoiding starting up non-sustainable interventions. PADF's approach, which is to concentrate on a small number of activities while training farmer groups to apply for other specific projects, is very relevant.

The project scope could expand to include animal husbandry in the regions where it plays a critical role in farmer incomes and in soil fertility management. Through its integrated watershed development approach, CRS has learned that the improvement of cow or goat raising requires a complex set of interventions in veterinary services, fodder technology, natural resource management and credit. It is not easy to undertake these activities except in specialized projects such as those undertaken in Haiti by Heifer International. Conversely, apiculture, fish raising, and to some extent local pig production, do not require integrated improvements, and are components of several projects.

The project implementers in Port-au-Prince seem to be more competitive than cooperative and

that means they don't know what others are doing. This lack of communication will not allow the sharing of information, experiences, plans, lessons learned, and other items. Transparency and information sharing will result in more effective and efficient projects.

C. Technical Support to Projects

1. Technical Personnel

All components of the PLUS/ASSET projects are staffed with well-trained and very experienced Haitian extension and administrative personnel. However, in addition to social and economic information, technology diffusion of soil and water conservation is site-specific and requires in-depth knowledge of biophysical conditions of project areas, including the diversity along the slopes, even in the same ravine. There is, therefore a need for projects to have senior technical staff with strong experience and expertise in soil conservation and agricultural watershed management in order to best address these site-specific needs.

"Off-the-shelf" interventions may be dangerous to hillside farmers if promoted without adequate technical knowledge and support.

Projects working to develop hillside agriculture can benefit from an increased and more continuous, uninterrupted presence of qualified professionals working in adaptive or applied research. Improvement of linkages of these project-based researchers with GOH researchers will depend almost entirely on the extent to which GOH staff can receive improved incentives, either from the GOH, or from the projects.

2. Information Systems

Technologies currently available in country have proven to be effective in increasing incomes and in achieving soil and water conservation objectives within the boundaries of specific projects, when the technologies have been adapted and properly extended. The success of some improved tree, field crop, and vegetable varieties indicates that continued introduction, improved testing, and broad extension of other and newer sources of germplasm is likely to prove successful as well. Supply of improved germplasm as an incentive for farmers to practice improved soil and water conservation can also be increased in future. The potential for success is great, if the proper information is delivered to hillside farmers and if follow up by qualified extension personnel is adequate.

Illiteracy of Haitian hillside farmers will be difficult to overcome, but some simple means of extension and market communications must be integrated into the projects if a major objective is to increase secondary adoption. The existing technical information and material, including

technical bulletins or *fiche techniques* on relevant subject matters, need to be collected and shared with all organizations working with hillside farmers. For example, although plantains are a major crop for farmers in most hillside projects, the team could find no *fiche techniques,* as are available in most developing countries, showing in illustrated forms, how to efficiently cultivate and harvest the plant to maximize revenue.

An area where more technical staff support is required throughout Haiti is in the provision of better market information. There must be a more formalized means to provide access to market information for hillside farmers to orient them to the laws of supply and demand which influence their production. Development of reliable market information provides a natural vehicle for technical and field staff to share their knowledge and expertise with farmers both inside and outside the project areas, thereby stimulating conservation interventions and technology adoption.

3. Training

Because environmental degradation is a holistic concern of hillside agriculture, projects must make sure that technical staff are competent in a watershed view of management. If staff are not knowledgeable in this more macro-oriented view of the hillsides, then training is necessary. Focusing on plots or farms alone will not be adequate to provide necessary benefits to the hillsides.

On-farm demonstrations are effective training tools and must be considered a primary way to train rural residents, especially those who are illiterate. Hillside projects are not generally promoting demonstrations or sharing the plots with other projects.

D. Social Issues

The narrow focus of many hillside projects on technical matters has often ignored the importance of social impacts. Broad social impacts generally trigger environmental and economic benefits; therefore, they are important considerations to the success of innovations and their adoption by hillside farmers. Most hillside projects fail to pay much attention to social ramifications of the introduced technologies.

In the Haitian context, the questions which project planners should examine include: (1) how many direct beneficiaries will there be; (2) where are potential beneficiaries located in the watershed and at what distance from the road; (3) can the activity in question play a positive role in education and adult literacy with no or little additional cost (e.g., by making information available in written form); (4) which type of activity is more likely to generate wage income

opportunities for the poor; and (5) how can the activity avoid triggering negative impacts on current agricultural and trade incomes of participant and non-participants, particularly women?

Land tenure does not appear to be the limiting factor to the numbers of direct beneficiaries throughout the hillside, as previously thought. Some areas are more afflicted by insecure land tenure than others. Examining research and discussions with farmers and extension agents demonstrate that the majority of farmers in most regions own at least their home garden and some portion of the land they farm. They adopt technology on these plots once they are convinced it is good for them, regardless of land insecurity. (White, 1992)

In conserving the fragile hillside soils, it is essential to work with farmers throughout the slope of the watershed. However, linkages between the location of participants within a watershed and environmental, economic, and social impacts are very complex and cannot easily be predicted. Site-specific analysis is necessary. For example, developing more intensive agricultural production at lower elevations of the slope may create more off-farm employment opportunities, reducing pressure to farm the upland slopes. However, in some locations with higher animal numbers, this might lead to increased upland grazing with further degradation of vegetation, resulting in increased soil erosion. Because of these complex linkages, farmers may be in the best position to decide whether it is in their interest to participate in project activities.

Carefully examining the potential impact of project activities on rural women farmers is essential in Haitian society because of recognized, acute gender issues. Women are traditionally fully involved in farming activities on several household plots. In addition, in the Northwest and other locations, where male migration is high, women play an increasingly important role in all farming operations, especially marketing, and in the development of incipient processing industries to increase income.

Any change, positive or negative, in the individual income of rural women is likely to relate directly to the quality of life and education for children.

Rural income may be influenced more by non-farm activities than farm activities. Thus, farmers have a vested interest in lower-cost foods. Part of this may be due to the fact that farmers sell at harvest and buy back grains later in the year at a higher price. Policies that increase food prices (such as import duties on cereals) may not be beneficial to the rural sector, especially if those individuals prefer rice, much of which is imported. A more efficient scheme (and one that could benefit farm families) might be to encourage production of export crops and import rice.

E. Technologies

Technologies currently available in-country are effective in increasing incomes and in achieving

soil and water conservation objectives within the boundaries of specific projects. The success of some improved tree, field crop, and vegetable varieties indicates that continued introduction, improved testing, and broad extension of other and newer sources of germplasm is likely to prove successful as well. Supply of improved germplasm as an incentive for farmers to practice improved soil and water conservation can also be increased in the future.

1. Soil and Water

In many areas visited by the assessment team, particularly in Northwest and Central Departments, soil conservation practices are being adopted by farmers. The same farmers, however, express a

need for improved methods of water management, particularly methods designed to capture and manage runoff. Runoff farming is a technique proven successful in barren, arid areas similar in some regards to parts of Northwest province. In slightly higher rainfall areas of Northwest province and on the central plateau, there is potential for constructing micro-catchments—in combination with vegetative barriers and/or construction of cisterns.

A number of soil and water conservation measures have proven successful in other tropical steepland areas. These may be of interest to Haitian hillside farmers and merit study of their appropriateness to Haitian circumstances. Physical structures other than those currently being widely extended in Haiti include a variety of reverse-slope bench terraces. Examples are individual basins in which trees or perennials are planted, intermittent terraces and convertible terraces. In addition, various mulches as alternatives to burning crop residues, and improved fallows with species such as *Gliricidia sepium* have given positive results on cultivated steeplands in Honduras (Juo and Thurow, 1997).

2. Livestock

Better management of livestock by hillside farmers is a critical aspect of decreasing degradation and increasing soil conservation and fertility. The proper utilization of livestock waste can greatly increase soil fertility. Extension personnel need better training in livestock management and demonstrations are required to achieve this and to educate hillside families.

3. Improved Germplasm

The introduction of improved vegetable and animal germplasm has been positive and its dissemination, although not widespread, has for the most part been beneficial to hillside agriculture. There is no “magic bean” to wonderfully increase revenues for subsistent farmers. Adaptive research will better target improved germplasm to farmer needs. In the meantime, farmers have access to some improved germplasm which are primarily imported and introduced

by donors and NGOs, although the Haitian private sector is taking the lead for vegetables, in some regions.

Studies financed by USAID estimated that there are over 10 million mango trees growing in Haiti, of which less than 10% are of commercial quality. Top-grafting of these indigenous, low quality, low production trees will significantly increase hillside farmer revenues.

4. Agro-forestry

The possibility of vetiver grass grown in hedgerows being uprooted for the essential oil in its roots is probably less a danger now, under current economic conditions, than in the past. It may be of interest as a low-cost method of establishing terraces. Nevertheless, care should be taken in its promotion. Methods to replace the vetiver with other physical or vegetative barriers—in the event of increased economic incentives to harvest the roots for essential oil—may be a subject for research. Such research would have to look at means to minimize erosion during the process of conversion.

F. Technology Transfer and Adoption

1. Information and Training

The dissemination of technology in Haiti is done in a haphazard manner. Most dissemination is done informally through projects, some is instigated by the GOH. Radio broadcasts are currently being done on a small scale, sometimes promoted by the GOH, sometimes donors and occasionally by the private sector.

2. Agricultural Extension Methods

The field training activities of top-down NGO extension systems can have a higher impact by developing more demonstration plots and more illustrative *fiches techniques* targeting the general population, especially the illiterate, as well as farmer leaders, and innovative farmers.

USAID-funded hillside agriculture projects have developed extension approaches well-adapted to the unstable political and funding environment of the last 14 years. These approaches have focused on agricultural technology and top-down implementation of project activities (training, input delivery and technical support). As a result, these projects have developed a body of core competencies in the production and/or delivery of tree seedlings and other inputs, and in implementation of agricultural extension programs adapted to the diverse regional, natural and social environments. The existence of skilled and dedicated Haitian staff is another

asset of hillside agriculture projects. Should the overall social stability improve, these projects will be able to evolve to a modern approach to extension, including both continuing current activities with active farmer groups, and delivering information and training services to broader, more diversified audiences. In this improved approach, the delivery of inputs and the supervision of soil conservation works may not be linked in all cases to extension activities with the active farmer groups. However, donor and NGO assistance will be required for the foreseeable future.

3. Effectiveness of current technology transfer methodologies

The effective and low-cost extension system developed over time by the USAID-funded AFII and PLUS projects has influenced the extension approaches adopted by other projects working in hillside areas. Its success can serve as a model for GOH and for donors that may eventually be interested in financing the rehabilitation of MARNDR extension efforts. Generally, unified government

extension services face enormous logistical, organizational and financial burdens in support of large numbers of government-employed field extension staff. The tendency by donors may be—almost by reflex—to design a rehabilitated government extension service with hundreds or thousands of
civil servants and field agents. The PLUS approach can be put forward as a viable alternative to this more traditional, but costly, approach.

Officials from USAID postulated that the Haitian Environmental Foundation (HEF) could fund some activities for extending environmentally sound agricultural innovations for hillside farmers. Once operational, the HEF would be a good source of multi-donor funding for efforts to replicate the PLUS (PADF/CARE) approach to extension in selected watersheds <u>not</u> covered by ASSET/PLUS or by another large-scale project. If the Foundation can undertake such an effort on a CBO basis, and if it succeeds, the HEF—or other similar funds—could over time take more responsibility for funding research/extension/development efforts. This process could form a cornerstone of USAID's eventual exit strategy for the hillside agriculture sector. (See Annex G for more discussion on the HEF and USAID's strategy.)

4. Rate of Spread Outside Project Boundaries for Technologies

There are a number of reasons that may account for the relative slowness or lack of secondary spread of promoted technologies, both in USAID-funded projects and in others:

Technologies may not have broad adaptation. They may well have to be modified to some extent by farmers, in order to be adapted to specific conditions and local management strategies within a region, within a farm, or even on a particular hillside. Such adaptation may not be immediately visible, but may have a critical positive impact on adoption, and therefore on improved natural resource management.

There is evidence that the determinants of adoption in a sector as diverse as Haitian hillside agriculture are highly location-specific (White, 1992).

There is a lack of well-defined GOH agricultural development policies for hillside development and no country-wide extension service able to give on-going advice to farmers in the process of trying out a new technology.

Private sector suppliers of inputs have no viable, wide-spread presence in rural areas as they compete with donor-provided inputs often given freely to farmers. Many technical changes promoted by hillside projects require the use of improved seeds, seedlings or seedling bags, tree grafts or additional tools. Delivery channels outside projects are absent, possibly due to subsidization, and quantities available from projects are limited and often offered on an untimely basis.

Information does not flow freely. Extension field agents from farmer groups, whose stipend depends on extension efforts within the group, may have no incentive to also facilitate adoption outside the group. Similarly, farmers who le arn tree graft have little incentive to inform their neighbors, perhaps because t his would reduce their own future economic advantage.

Farmers interviewed indicated that ignorance of new technologies was the major reason their neighbors did not adopt them. Others said some neighb ors tried a new technology but became easily discouraged when it did not produce quick results.

The absence of a strong ministry of agriculture, which in other countries sponsors agricultural fairs and other information dissemination opportunitie s.

There are no clear rules on how NGOs should work with CBOs, informal community groups, or individuals. The Haitian social setting seems to lead to a self-selection process of peer or client/patron beneficiaries. The positi ve aspect of this is active co-operation within groups; the negative aspect i

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The recently completed adoption study, currently being analyzed at Auburn University by Dr. Curtis Jolly, should quantify better the degree of adoption of PLUS-promoted practices, and—by extension—the overall rates of adoption. Because the results of this study are likely to have important implications for improvement of extension methods, priority should be given to its analysis, to the publication of its results in multiple formats (i.e., targeted and accessible to a variety of audiences), and to a wide dissemination among those working within the hillside agriculture sector. Discussion of these results—and their implications—could be an important part of the hillside agriculture sector conference planned for September 1999.

Both rate and overall level of adoption of new or newly refined technologies can be improved by better targeting of extension efforts. Before considerable resources are devoted to trying to extend a given technology throughout a project area and to all participating farmers within an area, *ex ante* assessment of the local adaptation and acceptability of the proposed intervention can be done to a greater extent than has been the case until now.

G. Applied and Adaptive Research

There does not appear to be a long-lasting, consistent commitment to research data collection and analysis in any current hillside project. USAID ceased this activity under PLUS in 1994. Field trials take many years to collect a scientifically valid sample of observations. Technical staff must be

hired and trained on data needs and collection procedures, and be able to use and train field staff in data collection; other technical staff must have time and resources to perform the necessary analyses. The benefits from such adaptive research will not be obtained within two or three years, but the payoff from sustained investments will be high.

There exists a belief within the donor community that there is a wide range of environmentally friendly, income-generating technologies "on the shelf", which can simply be selected for extension to farmers. The very high level of biophysical, social, and economic variability which exists in the Haitian hillside agricultural sector—together with the highly risk averse nature of Haitian farmers— makes an "off-the-shelf" approach unlikely to succeed, unless coupled with competent technical support.

1. Potential role of applied research

The role of applied research in support of smallholder hillside agriculture can best be limited in the short term to development-oriented adaptive research, with the primary objective of validating the performance, under Haitian conditions, of off-the-shelf technologies developed and tested in similar agro-ecological zones. This research is likely to be most effective if primarily—perhaps exclusively—on-farm, and aimed toward moving the validation of technologies "downstream" as quickly as possible.

Replicated trials with many treatments in a small number of locations are best limited to as few years as possible, especially in the case of annual field crops. Given the time and expensive devoted to these trials, every effort should be made to evaluate labor requirements necessary for implantation of the various treatments under test. These estimates of labor requirements can be used for evaluation of later, more extensive adaptation and pre-extension trials. It is better to give preference whenever possible and as early in the research process as possible, to single-replicate-per-site trials in a large number of sites, and with few treatments. Data collection in such trials should be strictly limited to only those variables necessary to express the evaluation criteria important to farmers. Collection of data of interest to researchers, especially those working on dissertations, should be strictly limited to those data, which also are directly needed for arriving at recommendations aimed at farmers. There is need for a viable structure for ensuring relevant adaptive research for the hillside sector. Such a unit would be responsible for adaptive on-farm research (technology validation), as well as necessary economic and social research.

The adaptation of technologies either to a broad range of environments or to a specific narrow range of environments needs to be identified better and more quickly than has been done in the past. This will allow more effective targeting of extension recommendations to only those farmers most likely to adopt the technology in question.

2. Benefits of past research activities

There have been significant benefits to hillside agriculture resulting from past research activities. Unfortunately, many more could be realized had information been more widely shared and research partners (funding agencies) have been more committed and consistent in their support to the sector.

Many donors have financed quality research which would have resulted in substantially greater benefits to farmers if support been more consistent and long-term in its perspective. Fortunately, many of the plantings of tree trials still exist and there is an effort to see to what extent monitoring of them can be reinstated. It is also fortunate that the results of the field crops trials have been properly documented and can be used in the design of future, more downstream research and extension efforts.

For a variety of reasons, there has not been a long-lasting, consistent commitment by the GOH or donors to data collection and analysis. Field trials take many years to collect a scientifically valid sample of observations. Technical staff must be hired and trained on data needs and collection procedures, and be able to use and train field staff in data collection; other technical staff must have time and resources to perform the necessary analyses. There is an urgent need to help rebuild national (GOH) research and extension capability in order to ensure long-term technical support to hillside farmers and to ensure sustainability of advances made by projects and outside organizations.

3. Monitoring and Evaluation

A major problem with the current monitoring and evaluation portions of many hillside projects is that they are measuring outputs (interventions and technologies adopted), but not impacts. Assessment team members learned that PLUS project funds for M&E were reduced. Impact measurement activities was the victim of this cut. USAID is now demanding better impact reporting, but without sufficient funds to hire field workers to conduct the necessary surveys, this reporting cannot be realistically done. Unfortunately the baselines and controls associated with the projects were not well developed and often the controls were violated when farmers adopted the technologies.

More scientific methods of evaluation are needed to provide more accurate, useful data. These methods involve random samples from project participants, but it is questionable whether most projects have the funding or the field staff, competent to manage data collection. If such an M&E system was in place, it would lead naturally to adaptive research needed to improve project impacts. Yet, because the M&E system does not provide reliable impact data and the research component of many hillside projects have either suffered for resources or been completely dropped, there is a lack of data on project impacts.

With all the resources going into hillside agriculture, it would seem that some of the reports requested by Romanoff et al. (1995) should be expected. Certainly occasional reports on the effects

of interventions and technologies on yields, crop budgets, adoption rates, and their impacts (based on field research) are not too much to ask. These analyses are particularly critical because of the diversity in Haitian hillside agriculture.

4. Impacts of Project Interventions and Technologies

There is unanimous agreement that Haitian agriculture can benefit greatly through the promotion of soil conservation measures and improved germ germplasm for food and tree crops. Yet there is not a great deal of evidence of significant secondary adoption by farmers outside the projects.

Secondary adoption of germplasm is slow in Haiti because of the need for demonstrated benefits. Some NGOs have overcome part of this problem by funding non-participating farmers to visit the fields of participating farmers. This gives the opportunity of farmers outside the project to see the benefits of better germ germplasm. However, there is always the problem that farmers are conservative and risk averse; so they are more likely to adopt technology when they are constantly provided information and oversight.

> Adaptive research (and its integration into M&E) is expensive and time-consuming, but it is crucial for ensuring the success of technology extension and accurate measurement of technologies' benefits.

There is a need to identify those specific evaluation criteria that guide farmers in their adoption decisions, a task which may itself be a subject for research. The criteria may be agronomic, economic, or social, and may vary from one region to another and from one category of farmer to another within a region. It is critical that these criteria be used—to the extent practicable, in light of available resources—for analysis of **all** research and extension activities.

In order to assess accurately the impact of currently extended technical packages—and also in predicting adoption of future packages—much more emphasis should be placed on return to farmer investment, particularly labor. Less reliance should be placed on simply estimating increases in revenues. When projects require farmers to pay (even at subsidized rates) for some components of the packages, such as improved seed and grafting material, the return to cash investment may become a more relevant criterion than income (revenues).

Monitoring indicators should concentrate on project inputs and outputs, while project impact

should be measured on a longer time span with a set of evaluation indicators. In hillside agriculture efforts, project inputs include staff, logistics and agricultural inputs. Project outputs are delivery of services by the project, not implementation of improved technology by participants. A limited set of output monitoring indicators should be selected on the basis of expected risks. Fewer indicators may be required as the project proceeds and risks perceived at the outset of the project are lifted. The

evaluation of projects related to natural resource management is a complex operation, which should be considered as research, not project implementation. Researchers instead of project staff should carry out this work.

H. Marketing Systems and the Development of Hillside Agriculture

1. New Marketing Ventures

Under PLUS project, ServiCoop and SECID have been engaged in a number of activities leading to higher net prices for farmers. For instance, they have helped farmer groups obtain market power by assembling their products as a group and selling their mangos directly to the exporting companies, rather than rely on marketing agents to purchase their mangos in the field.

PLUS and other projects are promoting the strengthening of processing and marketing groups, and many are starting small-scale cassava and plantain flour production. Gender analysis leads to identification of two potential issues. First, there is a risk that these groups, which are often comprised of economically better off members, many of whom are male, are progressively displacing traditional marketing channels. These traditional channels are operated *by Madams Sara* and poor rural women, often selling only their own production. Second, in villages with no other processing mills, cooperative mills are less likely to offer local women cheaper milling services than private mills. These services are essential to allow women access to direct labor or more productive, or rewarding activities.

The form of product entering the marketing system is also changing because of donor activities. Village-level processing initiated by SECID, is reducing transportation costs and adding value by introducing new product forms. Women are often involved in the processing of these products, so their roles and revenues can be enhanced through these changes. Often, they need credit for small-scale processing equipment and working capital to purchase the raw product.

On the other hand, PLUS project's support for product transformation is increasing employment opportunities in the rural sector. Most of the initial processing of manioc, plantain, bananas and mangos performed by CBOs in the PLUS project are done by rural women, who are paid for

their labor. In addition, the majority of staple food crops and vegetables are still marketed by women, and, as their production increases, so do their marketing opportunities and potential for increases in disposable income.

Some hillside agriculture projects are setting up micro-credit activities. In one case observed by the assessment team—which may be representative of several others—women mostly use credit to purchase consumer goods in the nearby town for resale in local villages. This type of credit may result in concentrating income from a large number of small-scale traders into a smaller number of

larger-scale operations (Wiens 1998). Gender analysis can also lead to identification of new opportunities. For example, project staff, working with villagers, could use markets as information dissemination points, while central nurseries could advertise for seedling delivery to the large numbers of women passing by daily.

2. Private Sector Development

The development of the private sector in hillside agriculture is constrained by weak GOH commitment to infrastructural support as is evidenced by poor market roads and extension support, marketing information system etc. In addition, donors and NGOs have been accused of undermining the private sector by providing free or subsidized services and inputs. Nevertheless, the private sector is still making headway, as Haitian entrepreneurs realize they must seize opportunities to improve themselves.

Developments in the haphazardly evolving marketing system must be monitored closely because there are sometimes joint outcomes which are not desirable. ServiCoop has developed a system that pays farmers based on the quality of their cacao. If the product brought to their facility does not meet export standards for mold, pest infestation, and moisture there will be a price discount. This is efficient from an economic viewpoint, but cacao cooperatives might complain vehemently when their shipments receive a very low price. Ultimately, when it is clear to producers that they have a vested interest in handling their cacao properly, the entire marketing system will work more smoothly and high quality production will be encouraged through higher prices.

In some instances, particularly for export crops, processing in secondary cities high productivity zones (HPZ) could be efficient if port facilities were improved. There is little reason that these export crops should be transported under the costly, inefficient road system when some investments in small-scale port facilities, along with some processing facilities (driers, sorting equipment, etc.) in Cape Hatien, Jacmel, and Jeremie could be much more economically efficient. There is some discussion about also developing such a facility in Dame-Marie. The Haitian Environmental Foundation could be used for the port development and USAID's micro-credit program could assist with financing the construction of the processing facilities. Enhancing

these processing capabilities would help USAID meet its RP-2 and RP-4 simultaneously.

3. Development of Commercial Crops

The development of commercial hillside crops enhances the role of commodity-specific farmer groups and change the roles of women in Haitian agriculture. There are potential social problems from this if the particular farmer *groupements* and CBOs have divisive social and political aspects, as has been common in Haiti in the past. A diminished role of the *Madams Sara* and other women involved in the commercial marketing system could eliminate a major source of income for rural areas and hillside agriculture. There is no indication that this is occurring. Traditionally, the

Madams Sara have not been important in assembling and transporting commercial crops such as coffee, cacao, and mangos.

I. Sustainability

There appear to be little sustainability designed in any of the donor hillside activities to conserve the soil and water and increase productivity and incomes. Given the dependence upon donor assistance, due to poor GOH infrastructural support to the hillsides, it appears sustainability of hillside development activities will remain an issue for some time to come.

However, there is positive momentum towards sustainability, even if not originally designed: Soil and water conservation structures and tree crops introduced over twenty years ago are still functioning with individual and village maintenance by rural populations which see the value of their benefits. There is the legacy of dynamic farmers who were introduced to new technologies and germplasm who have adopted and adapted them into their farming systems. As community based organizations better understand marketing concepts, they are consolidating, grading, processing and storing their produce to receive a greater income generation.

For purposes of sustainability, future projects in the hillside sector need to continue working with local NGOs, and, consider increased involvement of GOH personnel, to the extent permitted by their availability and access to necessary resources. There is scope for creative thinking in arriving at new approaches to providing incentives for GOH collaborators, within the limits of constraints placed on donor-funded initiatives regarding direct support to GOH. PADF has recently entered into such an arrangement with DDA agents jointly working with PLUS farmers on tree trials. This could serve as a model for future collaboration.

VI. RECOMMENDATIONS

Recommendations evolved from the hillside assessment focusing upon the specific objectives of increasing hillside farmers' economic benefits, introducing simple but effective soil conservation and agricultural technologies and supporting local institutions, particularly those that are sustainable and promote private enterprise.

A. Hillside Projects Must Continue to be Flexible to Meet Farmer Needs, but they Must Become More Encompassing on an Institutional and Environmental Basis and More Sustainable

· To enhance sustainability of activities, hillside projects should involve GOH personnel to the extent possible, given the GOH's limited financial and human resources. The development and implementation of land use management plans by communities, projects and local GOH representatives, strengthens sustainability by transferring land management to the hillside residents. This activity would be in compliance with the National Environmental Action Plan's focus on greater community involvement in managing their local resources.

· Future hillside projects could better address farmer needs by adopting a more coherent, multi-disciplinary, holistic, integrated watershed approach. This will better address farmer requests for both upstream and downstream farming and non-farming communities. It also would ensure a better representation of interventions, and, therefore, results leading to eventual impacts that can be replicated to other watersheds in Haiti.

· Project designs should be flexible to allow adjustment to potential but uncertain improvements in the evolving local institutional environment. To enhance this evolution, donors should increase project partnership approaches with local GOH agencies and CBOs and NGOs.

According to the Maissade report (White, 1992), farmers belonging to "*groupement*" and who participate in labor exchanges in general are more progressive and tend to adopt new technologies at a higher rate. These farmers are more likely to adopt new technologies than non-members: 79% versus 29%.

· Future donor-financed projects should conduct rapid reconnaissance surveys ("needs assessments") of the type done by Swanson et al. in 1993 for PLUS as a guide to adaptive research and extension efforts in those areas.

· The design of overall projects and individual project activities should routinely involve a simple process of social impact assessment. This assessment should be based on a small number of basic indicators, including: (1) numbers of expected direct beneficiaries; (2) location of beneficiaries in the watershed and distance from roads; (3) improved access to education and literacy; (4) preserved or improved agricultural and trade incomes for non-

beneficiaries, particularly women; (5) incremental wage labor opportunities for poorer farmers; and, (6) access to credit.

- Donors should continue to expand partnerships with domestic NGOs, particularly those that have demonstrated potential for private sector or commercial sustainability (such as ORE and ServiCoop) and for long-term involvement in hillside agriculture.

- NGOs should be allowed flexibility to adapt approaches to their hillside clients. They should be provided with an enabling environment so that they can continually improve and adapt their approaches to the needs of rural Haitians. Sometimes, for example, NGOs will focus on organizational development to improve CBO management; in other cases, NGOs can better serve needs by providing technical training to improve quality control for export.

- Donors and NGOs should only support those soil conservation projects where intended beneficiaries are the most likely to be committed adopt proposed technologies, based on "triage" criteria. These criteria will vary regionally and should be an important part of the selection decision. Extension approaches, which strengthen active farmer groups, such as CBOs and producer associations, and, access to market roads may be one such criteria, for example, should be favored.

Future hillside agriculture project designs should use cost-recovery, as a means to reduce subsidization and promote sustainability through private sector agricultural marketing activities. Given the disparity of the hillside resources, projects should work with those groups that have the necessary human and natural resources and infrastructure to succeed.

- Extension methods must be better adapted to the needs of more diversified audiences. Hillside project activities should be repackaged into: (1) technical support services to core farmer groups, (2) information and training for larger, more varied audiences, (3) input supply to a large number of clients, and (4) implementation of soil conservation works.

- For hillside areas that have become totally degraded and unsuitable for productive agricultural activity, the implementation of the USDA-type Conservation Reserve Program (CRP) may be a worthwhile alternative to release more marginal areas for natural rehabilitation and groundwater recharge. In a CRP-type program, farmers are paid to plant soil-conserving crops on their land for a number of years. Such a long-term and costly effort to promote true land fallow would require multi-donor support and commitment. The Haitian

Environmental Foundation would be an appropriate funding institution, once it is operational.

· The conference on hillside agriculture to be held in September should include presentation of the results-and a critical analysis-of the PLUS/PADF adoption survey now being analyzed at Auburn University. It should also feature a presentation of the PLUS project extension method as a model for a nation-wide approach to extension.

B. Hillside Projects Must Do a Better Job of Collecting and Disseminating Data and Information

· An information exchange program is critically needed. USAID should take the lead to improve the flow of information related to hillside agriculture at the national and international levels. This should be an objective of the fall conference on hillside agriculture. A range of activities should be organized with several partners, including (1) setting up a permanent documentation access point, (2) organizing subject-matter workshops, with support from relevant international specialists, (3) publishing a technical newsletter for a wide readership of NGOs, local governments, and farmer leaders, (4) donor meetings on a regular basis to discuss issues and share information, (5) developing electronic networks including developing a web page, sharing information with other hillside groups such as the Mountain Forum and improving communications with universities and CGIARs.

· USAID should consider financing the establishment within any follow-on project of a Validation and Liaison Unit (VLU), consisting of an agronomist/agro-forester, an agricultural economist, a social scientist. This unit would be responsible for adaptive research, identification of research needs (including social and economic research), and liaison among research and extension. The unit could also have marketing specialists. Alternatively, marketing could be done by a separate project unit. The VLU would identify research needs and identify collaborators in CGIAR centers, universities, CRSPs, and other research organizations (IICA, CATIE, etc. It could even be responsible, as a group, for all project M&E. The staff of the VLU should be senior professionals, either expatriate or Haitian. There may be a need for a separate marketing specialist, depending on the qualifications of the agricultural economist recruited. It might be most efficient to contract implementation of the VLU to a single organization (e.g., to a CGIAR center or an U.S. university or consortium).

· USAID should support a small team of experts to conduct a rapid assessment of the state of hydrological, soil and vegetative degradation on selected agricultural watersheds in the PLUS/ASSET project area using low-cost and state-of-the-art tools and methodologies. These tools might include satellite imagery readily available at NASA, local aerial photography, GPS and GIS tools. Such up-to-date biophysical baseline data is essential for planning and design of soil conservation interventions, large and small watershed management and

rehabilitation programs.

- Monitoring indicators should concentrate on project inputs and outputs, while project impact should be measured on a longer time span with a set of evaluation indicators. A limited set of output monitoring indicators should be selected on the basis of expected risks. Monitoring should make sure that project activities are not generating social, political, or gender problems. Fewer indicators may be required as the project proceeds and risks perceived at the outset of the project are lifted. The evaluation of projects related to natural resource management is a complex process, which should be considered as research, not project implementation. Researchers instead of project staff should carry out this work. It is under this evaluation activity where technology adoption should be assessed.

C. Hillside Projects Must Promote Private Sector Development

- Hillside projects should conduct a weaning process to place more input supply activities into a private, for-profit sector and quasi-private sector groups such as ServiCoop. This process should include (1) identification of existing small farm holder and several medium-size operators with more entrepreneurial potential, (2) maintenance of professional-standard germplasm sources for tree grafts and parent seed, (3) progressive reduction of subsidy rates for higher-return species, and (4) ending of full-scale support of tree distribution and planting. The process should also concentrate on monitoring selected farmers for technology adoption and productivity improvement purposes, to use for on-farm demonstrations. The same should be done for farmers producing seeds for annual field crops and for vegetables.

- Donors should increase policy dialogues with the GOH to promote changes proposed under the IMF Structural Adjustment Plan. Donor-GOH dialogs should address the policy biases affecting hillside agriculture, e.g., those discouraging the production of export crops such as coffee, and cacao; and, those increasing the cost of food staples, especially cereals.

- Donors should use credit programs to encourage the private sector to expand marketing activities. Village-level programs could provide funds for investment in small scale processing. Larger-scale lending could assist firms buy and set up more expensive equipment oriented towards export markets. The HEF could be a good vehicle for this assistance.

- Marketing should be a major component of future hillside development projects, concentrating efforts in three activities: information dissemination, technology and organizational training, and enterprise creation/support services. Where possible, this component should assist existing, diversified micro-entrepreneurs or groups in the marketing component to make them viable private sector entities. Micro-enterprise initiatives from project staff should be nurtured and supported through training. This should include marketing, processing and business skills, such as accounting, cash flow management, and financial analysis

- Future hillside activities should encourage synergistic relationships between high priority zones (HPZ) and nearby hillside projects' marketing components. As the private sector, demand-driven marketing chain grows, so too will more efficient and expensive processing centers develop near urban consumers, i.e., in the HPZ. USAID and other donors should examine ways to promote and economically support these potential employment generation industries, such as the USAID is considering by building a new cacao and coffee port facility in Dame-Marie.

D. Hillside Projects Must Strengthen Technical Components of their Programs

- Hillside projects should take a more holistic view of farmer well-being, including non-agricultural activities, to better address farmer needs and requests.

- Efforts should be made to improve the diversity of education provided to hillside farmers in several subjects: direct seeding of trees and grasses along the contour; traditional cultivation of indigenous plants for wood, fruit medicines, teas and nectar; and improved animal husbandry, including bee keeping and the principles of grazing and animal control, especially on fragile soils or near soil conservation structures.

- Donors should support long-term adaptive research and monitoring at representative sites. To the extent possible, adaptive research efforts, and eventually extension efforts as well, should be implemented across a wider range of environments, with the participation of a wider range of farmers. On-farm trial sites and extension zones should be representative of environments along the toposequence from top to bottom of the watershed. Participating farmers should be representative in terms of gender, access to and control over production factors and returns to production, access to input and product markets, diversity of farm enterprises, importance of off-farm income, etc.

- On-farm trials, particularly adaptation and pre-extension trials, should be the key component of an adaptive research program. These trials should devote more resources to economic, social, and biophysical characterization of farmers' environments than to measurement of agronomic response variables.

- Results of adaptive research should be measured in addition to criteria corresponding to project objectives, by farmers' own evaluation criteria which should be given equal or greater attention. Such criteria include yield increases (and/or quantities of water and soil conserved) per unit of labor or cash invested.

- USAID and other donors should utilize local radio as a means to disseminate needed information to rural areas. Farmers need to have up to date information on fruit and vegetable prices, storage techniques and pricing signals on when products should come out of storage.

This will serve to reduce price fluctuations in the market among seasons.

- To better meet farmer needs, projects should consider cost-effective ways to deliver basic veterinary services, as has been successfully done by CRS. The introduction of improved varieties and species of the smaller ruminant, especially breeds of milk goats, should be considered. As much as possible, the introduction of livestock inputs, including more efficient breeds, should be offered on a commercial, cost recovery scale, i.e., have farmers pay for medications, vaccinations and de-worming as well as for hardy new breeds.

- Additional study should be done by PLUS/ASSET to consider ways to better incorporate livestock issues as a way of increasing farmer incomes and meeting farmers' needs. Incorporating improved livestock management with soil conservation techniques will enhance sustainability messages in current training programs. Farmers will better appreciate the promotion of more ground cover crops, especially hardy grass-legume mixes for their ruminants.

- PLUS should increase its technical manpower, training and information exchange systems to better support ServiCoop, to encourage the marketing of export crops and the CBOs, to encourage the value-added transformation and marketing of vegetables and staple food crops.

- There is a need to recruit one or two senior technical staff with strong experience and expertise in soil conservation and agricultural watershed management to support the PLUS/ASSET projects. This specialist (or specialists) would be responsible for formulating and implementing field and watershed level soil and water conservation research, and for training local staff in soil conservation and watershed management. They would also conduct quantitative assessment and monitoring of water runoff, soil erosion, soil productivity, and plant production at both field and watershed level. If recruited as resident technical advisors, he/she (or they) could form part of the sort of validation and liaison unit described above.